



Lighting Assessment Report

SH1 Rolleston Access Improvements | Package 2 – Overpass and associated works

Prepared for New Zealand Transport Agency Waka Kotahi

Prepared by Beca Limited

23 October 2024



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Revision History

Revision N°	Prepared By	Description	Date
A	Ken Cuttle	Draft for client review	23 October 2024

Document Acceptance

Action	Name	Signed	Date
Prepared by	Ken Cuttle		23 October 2024
Reviewed by	Greg Williams FIES		23 October 2024
Approved by	David Aldridge		28 November 2024
on behalf of	Beca Limited		

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Executive Summary

The Rolleston Access Improvements project, being carried out for New Zealand Transport Agency Waka Kotahi (NZTA) is proposing the use of road lighting to illuminate the road way and overpass. Specifically, lighting is proposed at and adjacent to the Rolleston Drive overpass to clearly identify the proposed road infrastructure, to illuminate the road corridor, changes in alignment, road surface markings and kerb locations, as well as to illuminate stalled or stationary vehicles.

A preliminary lighting design has been carried out to enable the assessment of likely effects of the lighting installation.

Luminaires used in the design, and the design itself meet the requirements NZTA M30, and AS/NZS1158 series of standards. Luminaires are generally pole mounted at a height of 12m above ground level, and aimed away from residential units, providing less glare and spill light than might otherwise be observed.

NZTA M30 requires a Threshold Increment (glare control) below 12% and Upward Waste Light Ratio (UWLR) shall not exceed 0%. Because of these factors, and the use of full cut-off luminaires, the effects of glare, unwanted spill light, and upward waste light (that would contribute to sky-glow) on the environment are considered to be less than minor.

Along the majority the Project, there are buffer distances between the road carriageway and the adjacent properties, and this will assist in mitigating any effect of headlights. The effects from headlights are considered to be less than minor because the vehicles will not generally be moving directly towards residential properties.

Any additional landscape planting proposed between the proposed road corridor and residential properties will offer additional visual barriers that will further reduce the lighting effects.

Should a condition of consent be required to reinforce the district plan requirements, we recommend this is included in the NOR package.

1 Purpose of this Report

This Report has been prepared by Beca Limited (Beca) to inform the Assessment of Effects on the Environment (AEE) for one Notice of Requirement (NoR 2) being sought by New Zealand Transport Agency Waka Kotahi (NZTA).

The Project proposes to construct an Overpass from Rolleston Drive North to Jones Road and balance of works that are necessary to respond to both existing transport deficiencies as well as provide for the forecasted future growth pressures in the area.

This Report will specifically consider the actual and potential effects of the Project at the Pre-implementation and Implementation phases of this project as it related to lighting effects and recommendations to mitigate effects.

This report should be read alongside the AEE, which contains further details on the history and context of the Project. The AEE also contains a detailed description of works to be authorised within NoR 2, and the typical construction methodologies that will be used to implement this work. Where a description of an activity is necessary to understand the potential effects, it has been included in this report for clarity.

2 Project Description

Rolleston is one of the fastest growing towns in New Zealand and is experiencing transport pressures to keep the community connected and state highway intersections safe. In addition, there are increasing potential conflicts at road/rail crossings.

The urgent need for investment in the Rolleston transport network has been recognised as a Road of Regional (ROR) significance, with the Rolleston Access Improvements project part of the 'Canterbury Package'.

The project includes a number of safety and efficiency improvements (reduced deaths and serious injuries, greater travel choices and reduced travel times) on State Highway 1 and adjacent local roads in Rolleston. The objectives of the project are to:

- Improve the safety and efficiency of travel on the state highway and intersections with the state highway through Rolleston.
- Provide safer connections and access for goods and people travelling between the residential and industrial areas of Rolleston enabling transport choices.
- Improve the safety and travel time reliability of the regional journey on the state highway between Rolleston and Christchurch.

The Project is being delivered in two packages:

- Package 1 - SH1 / Dunns Crossing Road Roundabout and associated works.
- Package 2 - Overpass and balance of the works.

For the purposes of this Report, Package 2 will be discussed. Package 2 is summarised as follows:

- A new multi-modal overpass that will connect the residential and industrial areas of Rolleston. The flyover will provide

- improved facilities for walking and cycling.
- Upgrade of Jones Rd/Hoskyns Rd, Hoskyns Rd/SH1 and Rolleston Drive Nth/Kidman St intersections together with removal of the traffic signals.
- Safety improvements to intersections along SH1 through Rolleston, with a range of improvements to reduce deaths and serious injuries and better manage the forecast future growth in traffic volumes.
- Extending second southbound lane from Christchurch South Motorway Stage 2 (CSM2).
- Wire rope median barrier from CSM2 to just south of Brookside Rd
- Left in / left out at Rolleston Drive South.
- Safer access, via a southbound off-ramp and service lane, to the town centre and service businesses alongside SH1

The improvements will provide for a safe crossing of the State Highway and better connectivity between the Rolleston residential area the expanding industrial area.

3 Standards and District Plan provisions

3.1 Lighting Standards

In this Report, the following Lighting Standards have been referred to:

- AS/NZS 1158.0.2005 Lighting for Roads and Public Spaces Part 0 - Introduction
- AS/NZS 1158.1.1:2022 Lighting for roads and public spaces, Part 1.1: Vehicular traffic (Category V) lighting — Performance and design requirements
- AS/NZS 1158.3.1:2020 Lighting for Roads and Public Spaces Part 3.1 - Pedestrian Area (Category P) Lighting - Performance and Installation Design Requirements
- AS/NZS 4282:2023 Control of the Obtrusive Effects of Outdoor Lighting
- NZTA Waka Kotahi M30 Lighting Design Guidelines, Edition 1 Amendment 1: 2014

The proposed State Highway and other classified road lighting design and cycleway/walkways, together with luminaire selection, proposed for the Project will conform to the requirements of Road Lighting Standard AS/NZS 1158 series, referred to throughout this report as “the Standard”. The Standard provides for safe vehicle and pedestrian movement and the timely identification of objects and pedestrians, to the motorist’s eye, while travelling at speed during the darkness hours. Under the Standard, road lighting is defined into two types:

- Type V primarily for Vehicular movement; and
- Type P for Pedestrians movement

AS4282:2023 is a standard that specifically excludes application for road lighting, however is commonly used to set benchmark guidelines for evaluation of obtrusive light. As such, it has been referred to in this document for non-mandatory guidance.

NZTA M30 (referred to throughout this report as “the Guideline” is based upon the Standard and contains further refinement to technical lighting parameters relevant in particular to NZTA roads.

3.1.1 Road Lighting Category Selection

Using the selection criteria in AS/NZS1158.1.1:2022, Table 3.1, the provided AADT data, the Rightlight cat V calculator and professional judgement the Package 2 road carriageway and surrounds have been designed meet the requirements of AS/NZS1158.1.1:2022 subcategories V3

For clarity, the lighting subcategories that are applicable to specific roads within the project scope location

are shown below in Table 3-1:

Table 3-1: Road Categories

Location	Subcategory
Main South Road SH1	V3
Hoskyns Road	V3
Jones Road	V3
Rolleston Drive including new overpass	V3
Kidman Street	V4
Tennyson Street	V3

3.1.2 Level Crossing Lighting

The road lighting at the Road / Railway Crossing in Package 1 has been designed to meet the requirements of AS/NZS1158.1.1:2022 Part 4.6.

3.1.3 Pedestrian Lighting Category Selection

Using the selection criteria in AS/NZS1158.3.1:2020, Table 2.4 and professional judgement the pedestrian route of the rail crossing in Package 2 has been based on the requirements of subcategory PP2.

3.2 Partially Operative Selwyn District Plan

As a designated State Highway, the Project is not required to comply with the Partially Operative Selwyn District Plan (POSDP or the District Plan). However, when preparing this Report, the POSDP requirements and the lighting standards that are referred to in the District Plan, have been considered as these provide a guide to acceptable lighting in the Project area, proposed designation extent and the surrounding context.

As per Rule LIGHT-R2 of the POSDP artificial outdoor lighting for roads and public pedestrian accessways and cycleways is a permitted activity in all zones, providing the standards set out in LIGHT-REQ4 Sky Glow - Roads and Public Pedestrian Accessways and Cycleways are met.

LIGHT-REQ-4 is outlined below:

1. All artificial outdoor lighting for roads and public pedestrian accessways and cycleways shall:
 - a. Utilise flat glass luminaires; and
 - b. Be directed downward and shielded from above to ensure that all light shines below the horizontal; and
 - c. Have a maximum uplight value of U0; and
 - d. Have the ability to connect to control systems to enable lighting to be turned off or dimmed.

Additionally, NZTA is also required to comply with Section 153(3) of the Local Government Act 2002 which states that the Crown is bound by the bylaws if non-compliance by the Crown would be “likely to have an adverse effect on public health or safety”.

It is considered reasonable that the Project, inclusive of temporary construction lighting, comply with District Plan standards, as far as practicable, as these provide for lighting appropriate to the surrounding receiving environment.

In this case, the receiving environment is comprised of existing roading infrastructure, existing residential properties, railway reserve,

residential development, and open-space land.

3.3 Summary

The indicative lighting design carried out for Package 2 indicated that the requirements of the Standard and the Guideline, and the POSDP are able to be met.

4 Proposed Lighting

4.1 General

Lighting is proposed to be installed within and adjacent to the existing and proposed State Highway corridor, throughout the underpass, and adjacent to the shared path.

Lighting is required at the overpass and adjacent roads to clearly identify the proposed infrastructure, to illuminate the road corridor, changes in alignment, road surface markings and kerb locations, as well as to illuminate any stalled or stationary vehicles and adjacent footpaths. A potential lighting layout is depicted below:

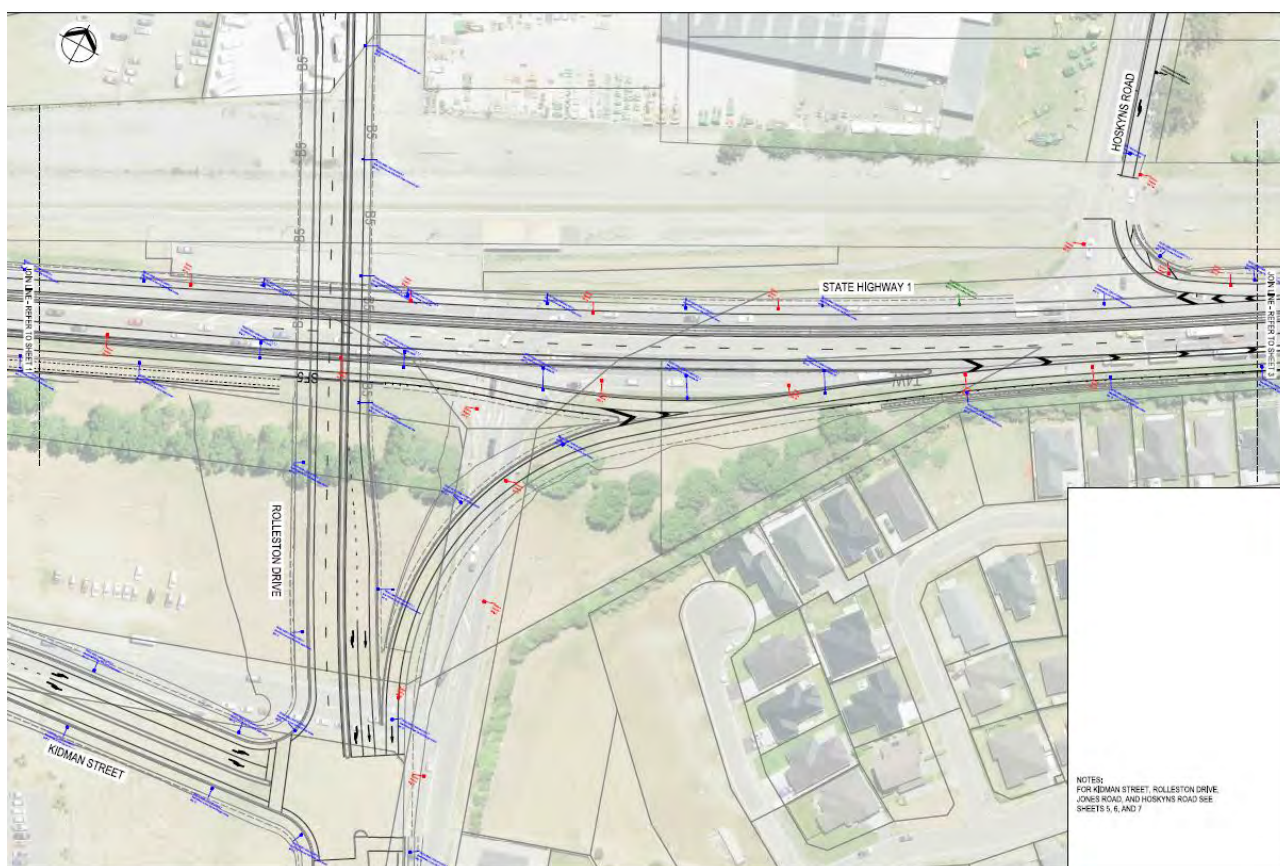


Figure 4-1: Sample image of indicative design

5 Assessment of Effects

5.1 Existing Environment

State Highway 1 within the Project area of Package 2 is currently illuminated with luminaires mounted on 12m galvanised lighting

columns with 3m mitred outreach arms. The columns are fitted with a mix of obsolete High Pressure Sodium luminaires and LED luminaires. The arrangement does not meet the current Light Technical requirements of The Standard. The existing SH1 lighting exceeds the spill limits to the back of some Dalwood Crescent properties prescribed in AS/NZS4282. There are substantial trees, bushes an elevated bank and fence that mitigate this.

The local, arterial and collector roads are currently illuminated with decorative columns with LED luminaires. The existing Rolleston Drive lighting within the scope of this project exceeds the spill limits to the back of some Rolleston Drive properties prescribed in AS/NZS4282 and does not appear to meet the light technical requirements for a Category V3 road defined in the Standard.

Proposed Environment

The proposed lighting will be installed on similar columns to the existing, and of the same height for continuity. The proposed changes to the existing road layout at the intersection result in a need for new road lighting, and lighting associated with the overpass and adjacent footpaths. The altered intersections and associated specified locations (such as the traffic islands) have been illuminated.

The upgrade of SH1 lighting will create a small increase in the spill light to the back of some Dalwood Crescent properties. This will be mitigated by the substantial trees, bushes, an elevated bank and fence between the lighting and the properties.

The upgrade of the Rolleston Drive lighting will alter the spill to some nearby properties. Some will decrease, some will increase. The affected properties are:

Figure 5-1: Affected properties

Vertical spill modelled at building in lux		
Location	Existing	Max proposed
11 Dalwood Crescent	0.0	0.8
13-19 Rolleston Drive	2.9	5.6
12 Milton Court (rear)	3.9	4.3
23 Rolleston Drive	3.8	1.6
25 Rolleston Drive	2.8	7.7
27 Rolleston Drive	1.2	4.4
31 Rolleston Drive	7.6	7.6

The modelled results from the indicative lighting design of spill lighting at residential windows are below the permissible limits noted within the Waka Kotahi NZTA M30 Design Guidelines. Additional information on how spill lighting is measured and calculated can be found in the next section of this assessment.

Dark adaptation lighting catering for road users has been included on the SH1. The preliminary lighting design has been reviewed and achieves the CPTED and Safety in Design (SID) objectives identified to date.

5.2 Potential Permanent Adverse Effects

Although the rules contained within the POSDP are not strictly applicable to designations, the standards provide some guidance on the levels of light that are acceptable to nearby sensitive receivers.

There are four main lighting effects that have the potential for varying degrees of intrusiveness to users of vehicles and to any residents adjacent to the proposed new lighting;

- Spill lighting
- Glare

- Sky glow (upward light content)
- Headlight sweep.

Spill Lighting

Light spill, which occurs when light extends beyond intended boundaries, can be either intrusive or beneficial depending on the situation. While excessive light spill can disturb residents and transportation users, it is sometimes necessary for safety, particularly on State Highways, arterial roads and underpasses to illuminate users of footpaths and shared paths for vehicular road users.

The indicative light modelling shows that it is possible to limit spill light to the windows of adjacent residential properties. We note that other than residential units, we are not aware of any other sensitive receptors or special ecological environments within the considered proximity.

Tables including detailed reporting of light spill at multiple residential locations are also included in Beca drawings. Spill lighting is calculated using the initial intensity values of the luminaires, to evaluate the worst-case scenario levels of spill lighting.

Our assessment of the lighting effects is that when the requirements of the Standard and the Guideline are met, the spill lighting levels on neighbouring residential properties will be less than minor.

Glare

Glare is the brightness of a luminaire when compared with the brightness of the background against which the luminaire is visible. For example, a road luminaire looks brighter (and has higher glare) when viewed against a dark sky than when viewed in the surroundings of an illuminated urban environment. There are two forms of glare:

- Disabling glare; and
- Discomforting glare.

Disabling glare is of an intensity that it prevents adequate vision for accomplishing a task. Discomforting glare can generally be tolerated, but is a nuisance, as it tends to draw the eye towards the light source.

The light technical parameter used in the Standard and the Guideline is Threshold Increment (TI), which is “a measure of the loss of visibility caused by the disability glare from the road lighting luminaires”.

Specified in the Standard, if the glare is kept below a 15% maximum of Threshold Increment (T.I.) then it is considered that glare is controlled to the driver’s eye. Specified in the Guideline, if glare is kept below a “10% maximum of Threshold Increment (TI) then it is considered that glare is controlled” to the driver’s eye.

Glare to residential windows, as a result of road lighting, is treated in response to individual complaints to the Selwyn District Council and can be controlled by the fitting of back or forward shields. Both these measures reduce the amount of light that is seen by the resident, but also can alter the luminaires photometric performance.

The indicative lighting design carried out for Package 2 shows that the TI achieved by the design is well within the limits specified in both the Standard and the Guideline. The compliance table for State Highway 1 will be included in Beca drawings.

TI is not specifically reported for intersections (it is calculated based on the luminaires placed along a straight road). Luminaires with the same optical distribution as used for the carriageways have also been used throughout the intersections.

The modelled results from the indicative lighting design of glare to road users caused by the road lighting are below the permissible limits within AS/NZS1158.1.1:2022 and the NZTA M30 design guidelines. Given the separation of the road

carriageway and therefore the lighting from residential properties, it is our assessment that the glare effects from the road lighting can be controlled to the point where these effects are less than minor.

Skyglow Effect

Sky glow is caused by light being directed upwards into the sky, and/or reflecting directly or indirectly off the road surface and illuminating particles in the atmosphere. While challenging to reduce the effects of reflected light, direct light is addressed by limiting or removing the direct upward component from luminaires. It is important to recognise that sky glow results from the combined effect of thousands of road lights along with the exterior lighting of urban areas (such as residential, commercial and industrial areas).

The lighting proposed in the indicative lighting design meets the requirements of the Standard and the Guidelines and limits the direct upward spill light to less than 1%.

The potential of Skyglow as a result of the proposed lighting is appropriately controlled, as such, there are considered to be less than minor adverse effects associated with sky glow from this project.

Headlight Sweep

Headlight sweep refers to the movement of a vehicle's headlights as the vehicle approaches, passes, and moves away from a particular point. This sweeping motion of light can momentarily brighten areas not illuminated by fixed lighting, such as the sides of roads or adjacent properties.

It is anticipated that effects from headlights are most likely to affect residential properties when headlights are directed toward a dwelling. Where headlights are visible from passing traffic, with headlights oriented at obscured angles, the effects would be less than if headlights were directed towards residential units. Within the Project area, there are buffer distances between the proposed road and the adjacent residential properties to the east, this will further assist in mitigating the effect of headlights.

It is not anticipated that light emitted from headlights will give rise to adverse effects for owners and occupiers of the residential units on Main South Road SH1, adjacent to the Project area. It is worth noting that the residential boundary nearest the proposed overpass, in Wyndham Mews is setback 28m from the nearest existing carriageway. This will now be setback 40m from the nearest proposed carriageway– and inside the sweep angle.

The separation distance between the Project and residential properties will minimise light from headlights beyond the proposed SH designation. As such, it is considered that any effects associated with headlight sweep will be less than minor.

Construction Lighting Effects

It is reasonable to expect that any temporary construction/laydown area lighting achieves compliance with the relevant rules with the POSDP as this provides for a lighting environment appropriate to the surrounding receiving environments.

Temporary flood lighting for construction activities, where installed adjacent to residential areas, may require glare and spill light control. This lighting has not yet been designed and will be considered through a Construction Management Plan however it is anticipated that this lighting will be fully compliant with the requirements of POSDP rules for obtrusive light and the relevant clauses of the Australian/New Zealand Standard (AS/NZS 4282).

The Contractors working on the Project may be required to use floodlights, either portable or temporary, to assist in the construction process depending on timing. Should these be required, these should be mounted so that they do not cause excessive glare towards residential properties. This can be controlled by the careful selection of luminaire type and monitored care of luminaire aiming angles.

Mitigation of adverse effects relating to temporary construction lighting can be undertaken with cut-off luminaires, sunshade cloth screening and through achieving appropriate setbacks from sensitive receivers. Construction lighting is usually relatively transitional and will be reduced with careful location of any on-site offices and equipment in relation to the residential area.

Construction lighting effects will be managed via the Construction Environmental Management Plan.

Lighting Infrastructure - Types of Luminaires

Street and road luminaires are available in three primary light distribution types: open, semi-cut-off, and fully cut-off (also known as aero-screened). To control glare and spill light in and adjacent to the Project area, fully cut-off luminaires (known as Type 3) are proposed to be used.

The proposed fully cut-off luminaire directs no light above the horizontal plane. The types of luminaires proposed for this Project are on the NZTA Waka Kotahi M30 approved luminaire list.

Beca Drawings 3338703-20-CU set 3500 indicate one potential option for the road lighting design. All luminaires selected should achieve the photometric and material requirements of the Standard and the Guideline.

6 Recommended Mitigation Measures

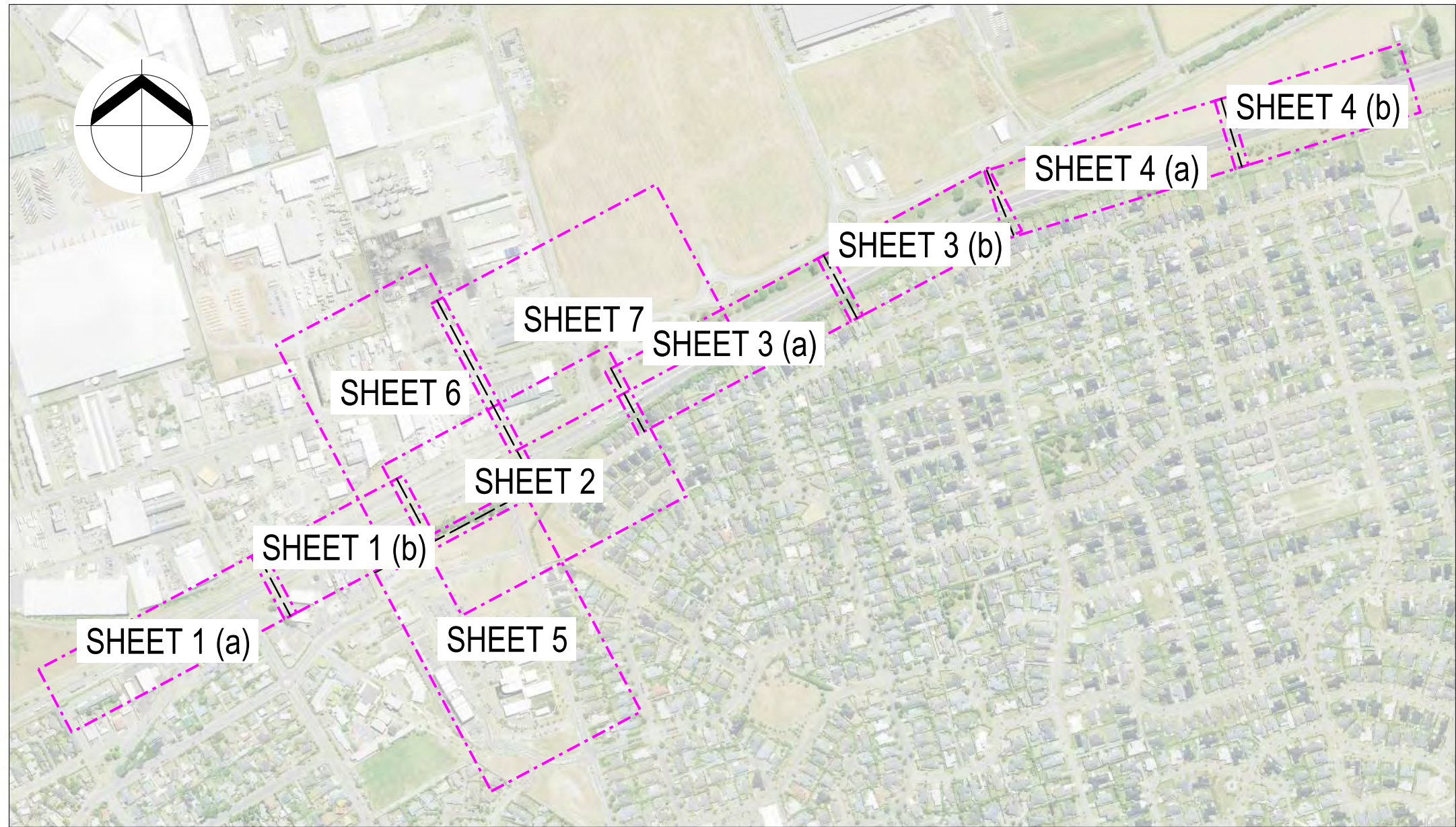
It is not practical to model the effect of the immediate surroundings, and as such the model does not take into account natural land profiles or physical blocking of the emitted light by existing fences, vegetation and trees. All of these have the effect of further reducing spill light and glare to immediately adjacent properties and recognition of this needs has been taken into account in the assessment of effects.

The POSDP notes that the lighting associated with roads is a permitted activity in all zones, providing the standards set out in LIGHT-REQ4 Sky Glow - Roads and Public Pedestrian Accessways and Cycleways are met. Furthermore, this assessment of effects has reviewed the computer modelled lighting effects from an indicative lighting design for this project.

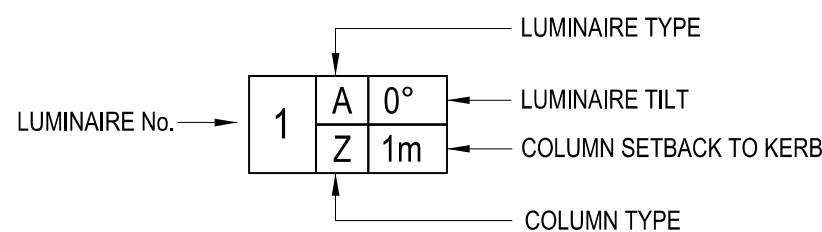
Provided the requirements of the Standard (AS/NZS1158, current versions as of 28/7/2024) and the Guideline (NZTA M30, current version as of 28/7/2024) are used to determine the lighting solutions applied, the effects of lighting on road users and adjacent residential property occupiers is generally considered to be less than minor.



Appendix A – Lighting Plans and Calculations



TYPICAL COLUMN DESIGNATION:

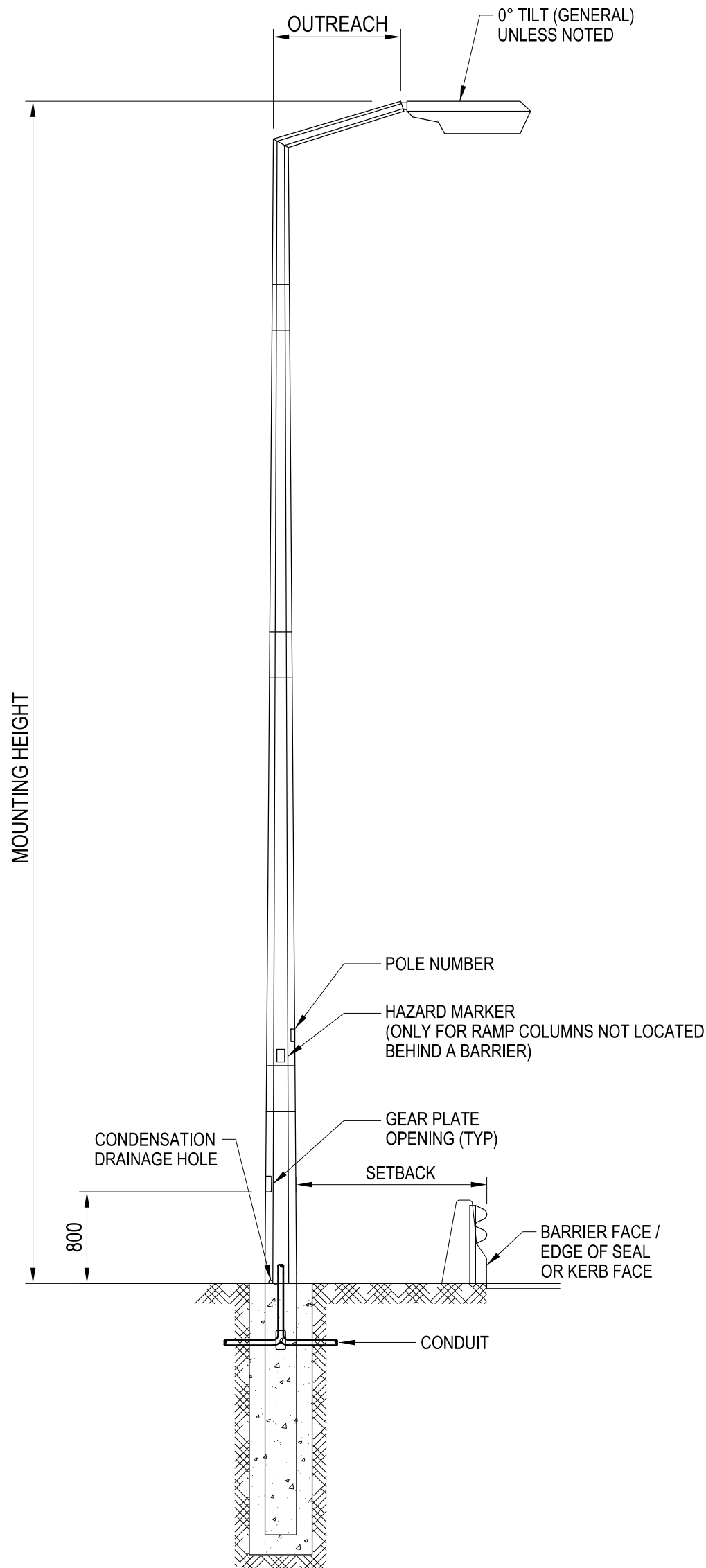


LUMINAIRE TYPE LEGEND:

- A EXISTING, NO CHANGE.
- B ADD NEW UNDERPASS LIGHT PLACE SURVIVOR 100 CLASSIC CORNICE SVR100CLA-COR1200-DA2840060-WHT LED LUMINAIRE IN CONTINUOUS EXTRUSION
- D LUMINAIRE TO BE REMOVED.
- E ADD NEW STREET LIGHT PLACE TECEO GEN2 1 5308 350mA 4000K LED LUMINAIRE.
- F ADD NEW STREET LIGHT PLACE TECEO GEN2 1 5308 500mA 4000K LED LUMINAIRE.
- G ADD NEW STREET LIGHT PLACE TECEO GEN2 1 5308 850mA 4000K LED LUMINAIRE.
- H ADD NEW STREET LIGHT PLACE TECEO GEN2 1 5308 1000mA 4000K LED LUMINAIRE.
- J ADD NEW DITTO 700mA 4000K LED LUMINAIRE.
- K ADD NEW STREET LIGHT PLACE NEW ITALO-2 0F2H1 S05 4-100.5M 4000K LED LUMINAIRE.
- L ADD NEW STREET LIGHT PLACE NEW ITALO-2 0F2H1 S05 4-100.7M 4000K LED LUMINAIRE.
- LUMINAIRE SHOWN FOR REFERENCE WHEN NOT ON ROAD OF FOCUS

COLUMN TYPE, MOUNTING HEIGHT:

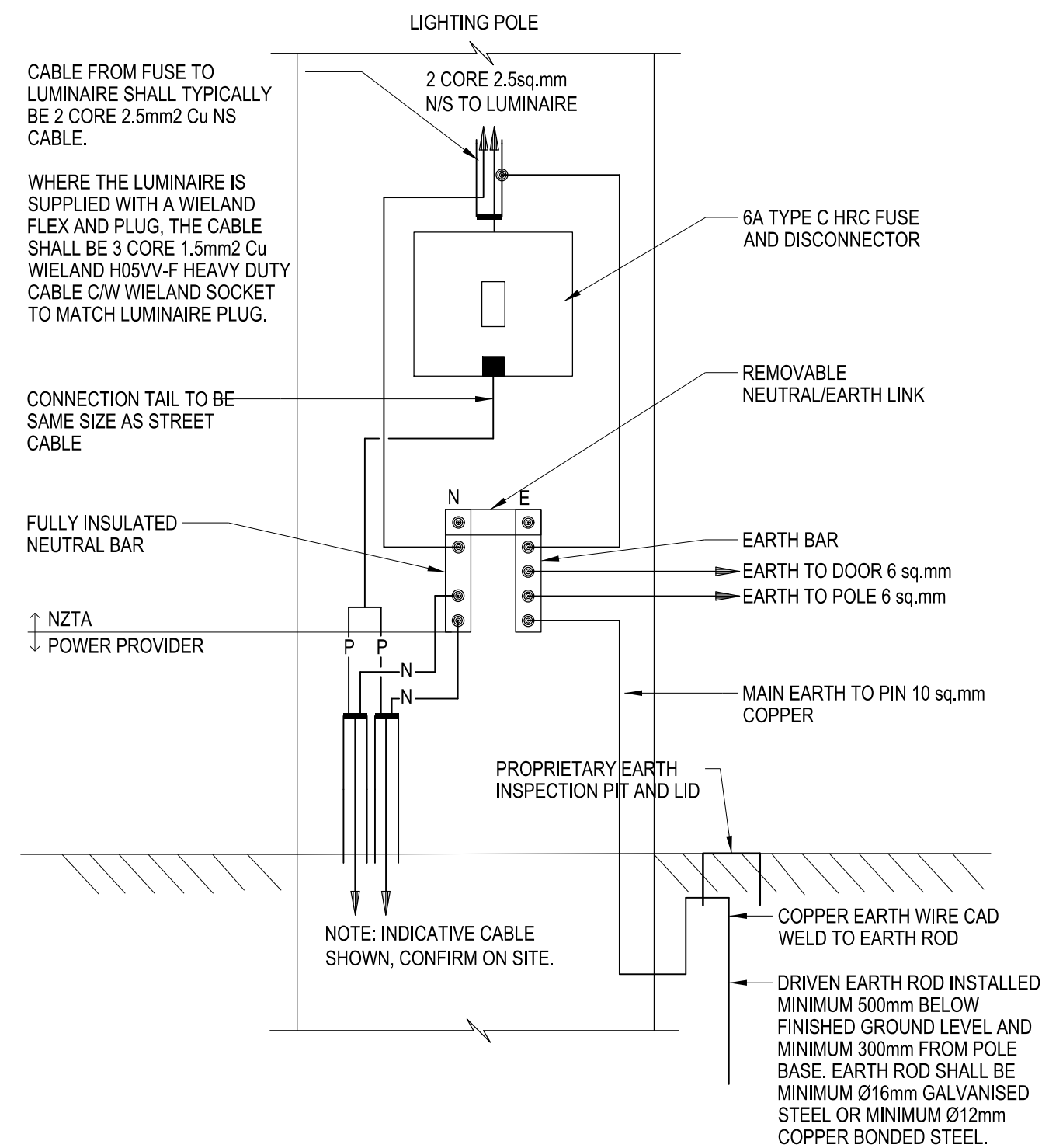
- M PLACE NEW DOUBLE MITRED OUTREACH 180DEG FRANGIBLE SHEAR BASE OCTAGONAL STEEL COLUMN 12.5m MOUNTING HEIGHT 2m OUTREACH
- N PLACE NEW FLANGE BASED MITRED OUTREACH FRANGIBLE IMPACT ABSORBING OCTAGONAL STEEL COLUMN 12.5m MOUNTING HEIGHT 2m OUTREACH
- O PLACE NEW GROUND PLANTED MITRED OUTREACH FRANGIBLE IMPACT ABSORBING OCTAGONAL STEEL COLUMN 12.5m MOUNTING HEIGHT 4m OUTREACH
- P PLACE NEW GROUND PLANTED MITRED OUTREACH FRANGIBLE SHEAR BASE OCTAGONAL STEEL COLUMN 12.5m MOUNTING HEIGHT 4m OUTREACH
- S PLACE NEW GROUND PLANTED MITRED OUTREACH FRANGIBLE IMPACT ABSORBING OCTAGONAL STEEL COLUMN 10.5m MOUNTING HEIGHT 2m OUTREACH
- T REMOVE COLUMN
- U PLACE NEW GROUND PLANTED MITRED OUTREACH FRANGIBLE SHEAR BASE OCTAGONAL STEEL COLUMN 12.5m MOUNTING HEIGHT 2m OUTREACH
- V PLACE NEW GROUND PLANTED MITRED OUTREACH FRANGIBLE IMPACT ABSORBING OCTAGONAL STEEL COLUMN 10m MOUNTING HEIGHT 2m OUTREACH
- W PLACE NEW GROUND PLANTED MITRED OUTREACH FRANGIBLE IMPACT ABSORBING OCTAGONAL STEEL COLUMN 14m MOUNTING HEIGHT 4m OUTREACH
- X PLACE NEW MITRED OUTREACH FRANGIBLE SHEAR BASE OCTAGONAL STEEL COLUMN 14m MOUNTING HEIGHT 4m OUTREACH WITH ADDITIONAL SPIGOT AT 180DEG 8m MOUNTING HEIGHT 0m OUTREACH
- Y EXISTING COLUMN, MOUNTING HEIGHT AND SETBACK FROM KERB.
- Z EXISTING, NO CHANGE.



TYPICAL GROUND MOUNTED SECTIONAL GALVANISED
POLE WITH MITRED OUTREACH FOR NZTA POLES
SCALE: NTS

STREET LIGHTING NOTES:

- ALL WORK SHALL CONFORM TO THE REQUIREMENTS OF POWER UTILITY (ORION) , LOCAL TERRITORIAL AUTHORITY (SELWYN DISTRICT COUNCIL) AND THE REQUIREMENTS OF ELECTRICAL (SAFETY) REGULATIONS 2010, AS/NZS 3000, AS/NZS 3008 AND AS/NZS 1158.
- ONLY CONTRACTORS APPROVED BY LOCAL TERRITORIAL AUTHORITY CAN WORK ON THE LOCAL TERRITORIAL AUTHORITY STREET LIGHT NETWORK. PLEASE CONTACT THE TEAM LEADER STREET LIGHTS IF YOU REQUIRE FURTHER CLARIFICATION.
- ENSURE THE RAMM AND SLIM DATABASE IS ACCURATELY UPDATED WITHIN 24 HOURS OF THE INSTALLATION FOR EVERY NEW OR MODIFIED STREETLIGHT LOCATION, AND LIAISE WITH LOCAL TERRITORIAL AUTHORITY TO ENSURE RECORDS ARE APPROPRIATELY COMPLETED.
- THESE WORKS SHALL INCLUDE THE REMOVAL AND DISPOSAL OF OLD LUMINAIRES AND POLES, UNLESS SPECIFIED OTHERWISE.
- ALL LUMINAIRES SHALL BE TILTED AT AN ANGLE OF 0° TO THE HORIZONTAL UNLESS STATED OTHERWISE.
- EACH LUMINAIRE SHALL BE PROVIDED WITH A 7 - PIN NEMA SOCKET AND A BLANKING CAP.
- A MINIMUM TEN (10) YEAR WARRANTY FROM DATE OF ON SITE INSTALLATION SHALL BE PROVIDED FOR THE LUMINAIRES.
- SERVICES AS-BUILTS PROVIDED ON AN AS IS BASIS, CONTRACTOR TO CONFIRM LOCATIONS OF CONDUITS AND ORION CABLES ON SITE BEFORE CONSTRUCTION COMMENCES. CONTRACTOR RESPONSIBLE FOR COORDINATING FINAL DESIGN WITH ORION AND NOTIFYING ENGINEER OF ANY DEVIATIONS TO THE PROVIDED DESIGN.
- MINIMUM STREET LIGHTING SUPPLY CABLE SIZE SHALL BE 1C 10mm² NEUTRAL SCREEN CABLE.
- CABLE PROTECTION SHALL BE IMPLEMENTED AS PER POWER UTILITY REQUIREMENTS AND AS/NZS 3000.
- ALL METAL COLUMNS, OUTREACH ARMS AND LUMINAIRES ARE TO BE EFFECTIVELY EARTHED. EARTHING IS TO BE DESIGNED TO CONFORM TO THE REQUIREMENTS OF THE NZ ELECTRICITY (SAFETY) REGULATIONS AND AS/NZS 3000:2007.
- MOUNTING HEIGHTS ARE TO BE MEASURED WITH RESPECT TO THE LUMINAIRES ABOVE THE CARRIAGEWAY.
- WHERE A POLE IS WITHIN 2m OF THE DRIPLINE OF THE TREE, ASSESS WHETHER THE TREE REQUIRES TRIMMING TO MINIMISE SHADOWING, AND NOTIFY THE ENGINEER FOR FURTHER ACTION IF REQUIRED.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE FINAL LOCATION OF LIGHTING POLES ON SITE BY TAKING INTO ACCOUNT THE FOLLOWING PRIOR TO INSTALLATION:
 - LOCATION OF EXISTING SERVICES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING ALL UNDERGROUND SERVICES AND LAND INFORMATION NEW ZEALAND MARKERS BEFORE WORK COMMENCES. ANY DAMAGE CAUSED TO EXISTING SERVICES SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE.
 - WORK ON OR NEAR EXISTING SERVICES.
 - THE CONTRACTOR SHALL LIAISE WITH THE APPROPRIATE SERVICE PROVIDER IN RELATION TO WORKING ON OR NEAR SERVICES, GIVING APPROPRIATE NOTICE PERIOD. IF NECESSARY, POSITIONS MAY BE ALTERED UP TO 1M WHILE RETAINING GENERAL POLE ARRANGEMENT TO AVOID CLASHES WITH UNDERGROUND SERVICES. CONFIRM WITH ENGINEER FIRST.
 - THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE FIXING OF OUTREACHES TAKING INTO ACCOUNT WORK ON OR NEAR EXISTING SERVICES.
 - PERMITTED LOCATION TOLERANCE
 - 0.5m PARALLEL TO THE CARRIAGEWAY
 - 0.2m PERPENDICULAR TO THE CARRIAGEWAY
 - 0.2m VERTICALLYIF THE FINAL POLE LOCATION EXCEEDS THE PERMITTED TOLERANCE FURTHER LIGHTING DESIGN MAY BE REQUIRED.
- POLE DETAILS SHALL BE AS PER LOCAL TERRITORIAL AUTHORITY ENGINEERING STANDARDS. DEPARTING FROM THE STANDARD INSTALLATION DUE TO GROUND CONDITIONS SHALL BE CONFIRMED BY A WRITTEN APPROVAL PRIOR TO INSTALLATION.
- LIGHTING COLUMNS SHALL BE INSTALLED AS PER MANUFACTURER INSTRUCTION AND STANDARDS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE FOUNDATION DESIGN OF THE LIGHTING COLUMN IF GROUND CONDITIONS DO NOT SUIT THE COLUMN MANUFACTURER'S STANDARD FOUNDATION DESIGN.



GEARPLATE TWO CORE CABLE TERMINATION WITHIN
POLE FOR SHEAR BASE POLES
SCALE: NTS

A	FOR PRELIMINARY SAFE SYSTEM AUDIT	RAA	KC	DA	06.11.24
No.	Revision	By	Chk	Appd	Date

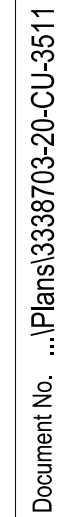
Original Scale (A1)	Design	K.CUTTLE	24.09.24	Approved For Construction
NTS	Drawn	R.ANDERSON	24.09.24	
Reduced Scale (A3)	Design Checker			
NTS	Drop Check			
	* Refer to Revision 1 for Original Signature			



Client:	SH1 ROLLESTON ACCESS IMPROVEMENTS PACKAGE 2
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Title:	LIGHTING DRAWING KEY, NOTES AND LUMINAIRE SCHEDULE
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Discipline:	CIVIL ENGINEERING
Drawing No.	3338703-20-CU-3500
Rev.	A



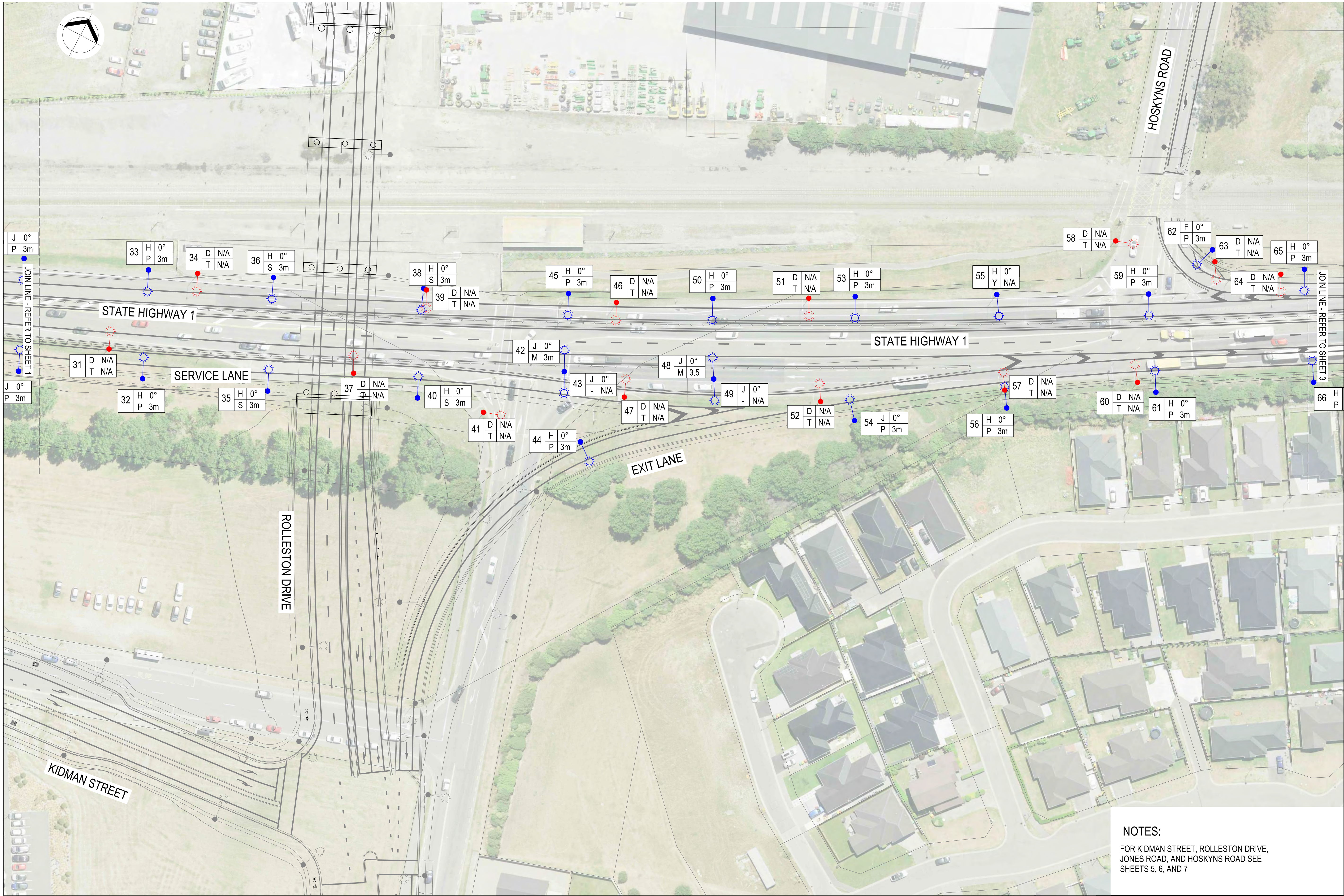
SH1 ROLLESTON
ACCESS IMPROVEMENTS
PACKAGE 2

LIGHTING LAYOUT PLANS
SHEET 1 OF 7

PRELIMINARY
NOT FOR CONSTRUCTION

DO NOT SCALE FOR SET OUT DIMENSIONS

IF IN DOUBT ASK.



NOTES:
FOR KIDMAN STREET, ROLLESTON DRIVE,
JONES ROAD, AND HOSKYN'S ROAD SEE
SHEETS 5, 6, AND 7

PRELIMINARY
NOT FOR CONSTRUCTION

A		FOR PRELIMINARY SAFE SYSTEM AUDIT	RAA	KC	DA	06.11.24
No.	Revision	By	Chk	Appd	Date	

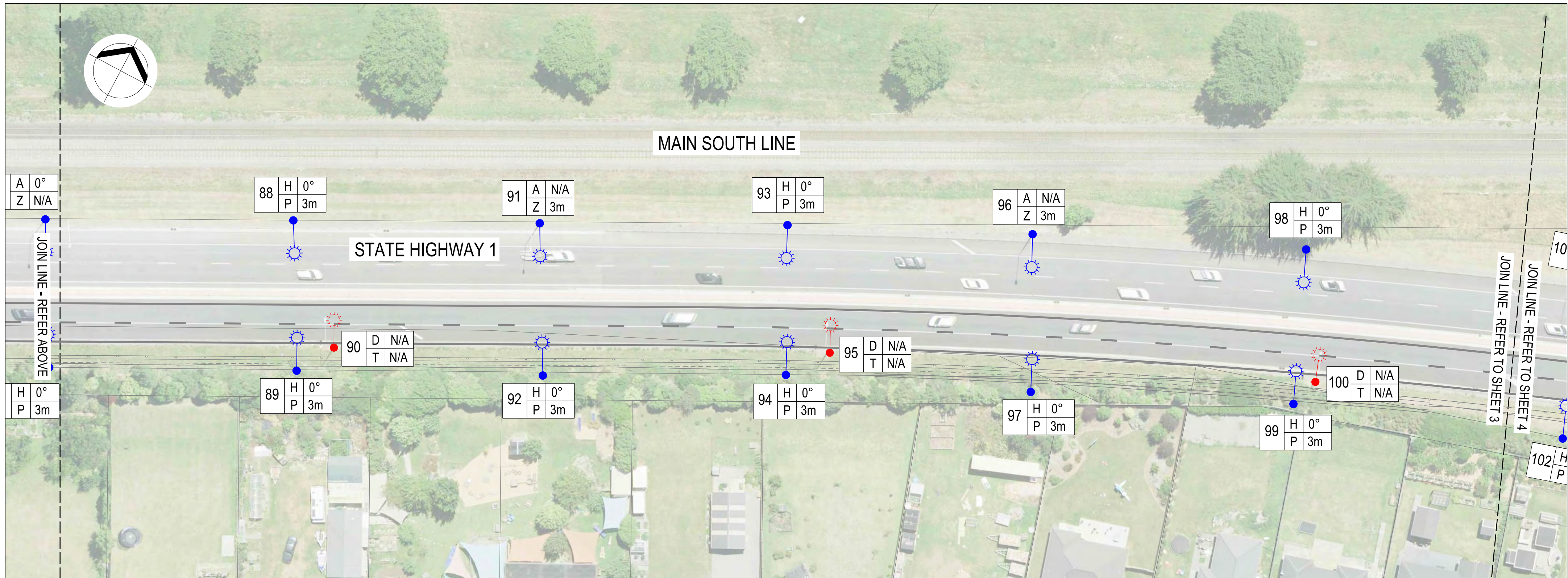
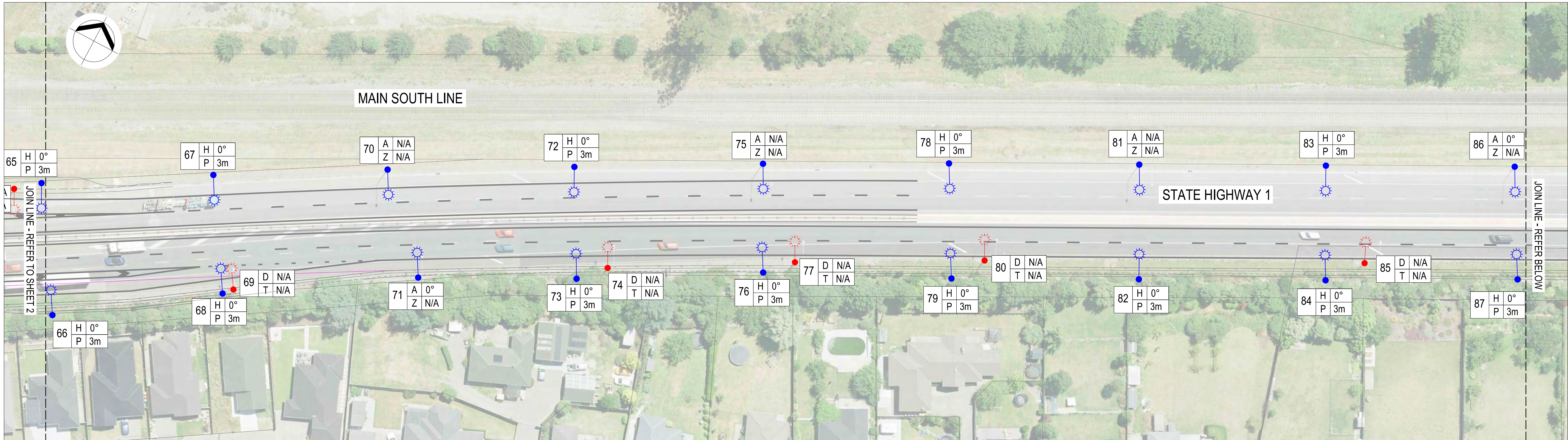
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1:500	Drawn	R.ANDERSON	03.04.24	
Reduced Scale (A3)	Design Verifier			
1:1000	Design Check			
	* Refer to Revision 1 for Original Signature			Date



Client: SH1 ROLLESTON
ACCESS IMPROVEMENTS
PACKAGE 2

Title: LIGHTING PLANS
SHEET 2 OF 7

Discipline	CIVIL ENGINEERING
Drawing No.	3338703-20-CU-3512
Rev.	A



A	FOR PRELIMINARY SAFE SYSTEM AUDIT	RAA	KC	DA	06.11.24
No.	Revision	By	Chk	Appd	Date

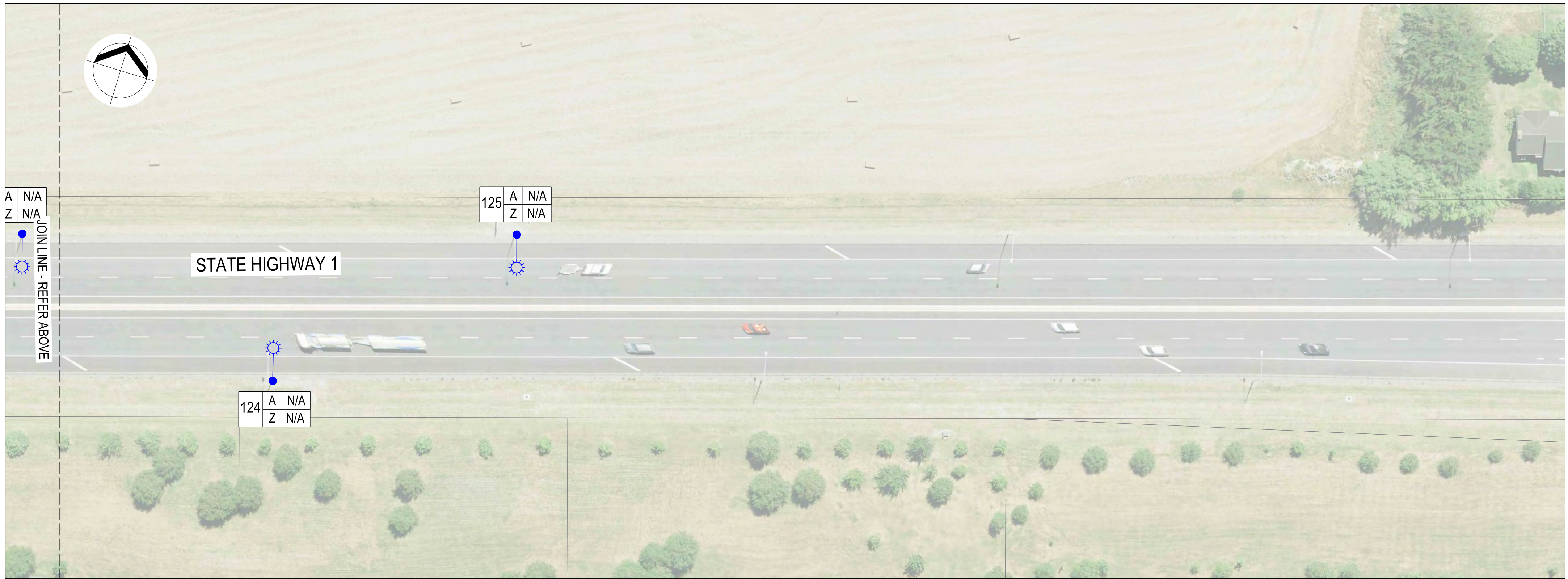
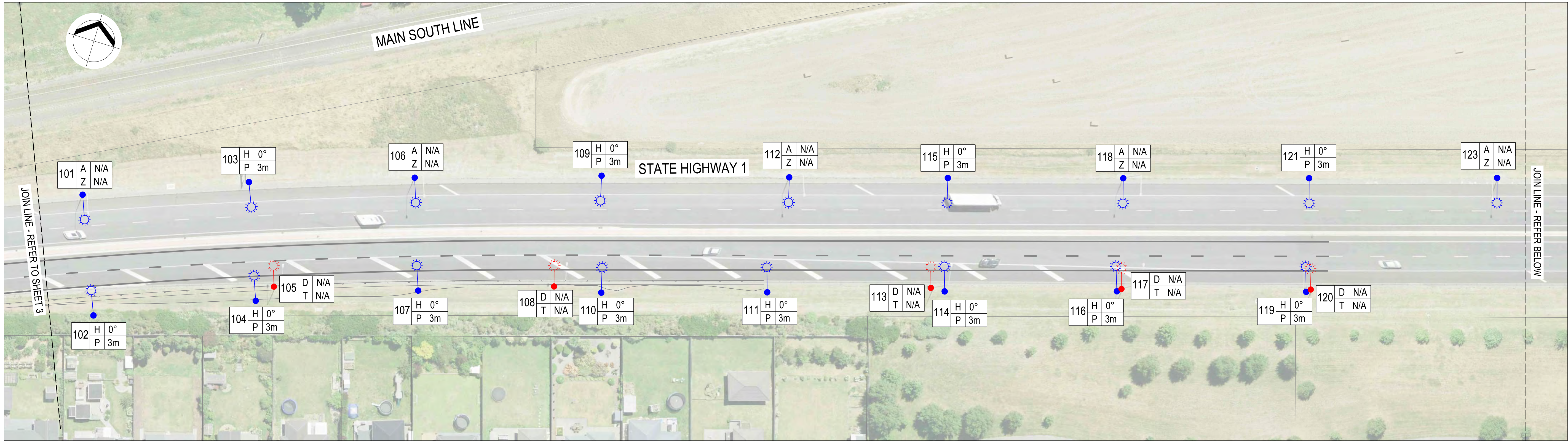
Original Scale (A1)	Design	M.HARRIS	03.04.24	Approved For Construction*
1:500	Drawn	R.ANDERSON	03.04.24	
Reduced Scale (A3)	Design Verifier			
1:1000	Design Check			
	* Refer to Revision 1 for Original Signature			



Client: SH1 ROLLESTON
ACCESS IMPROVEMENTS
PACKAGE 2

Title: LIGHTING PLANS
SHEET 3 OF 7

Discipline	CIVIL ENGINEERING
Drawing No.	3338703-20-CU-3513
Rev.	A



A	FOR PRELIMINARY SAFE SYSTEM AUDIT	RAA	KC	DA	06.11.24
No.	Revision	By	Chk	Appd	Date

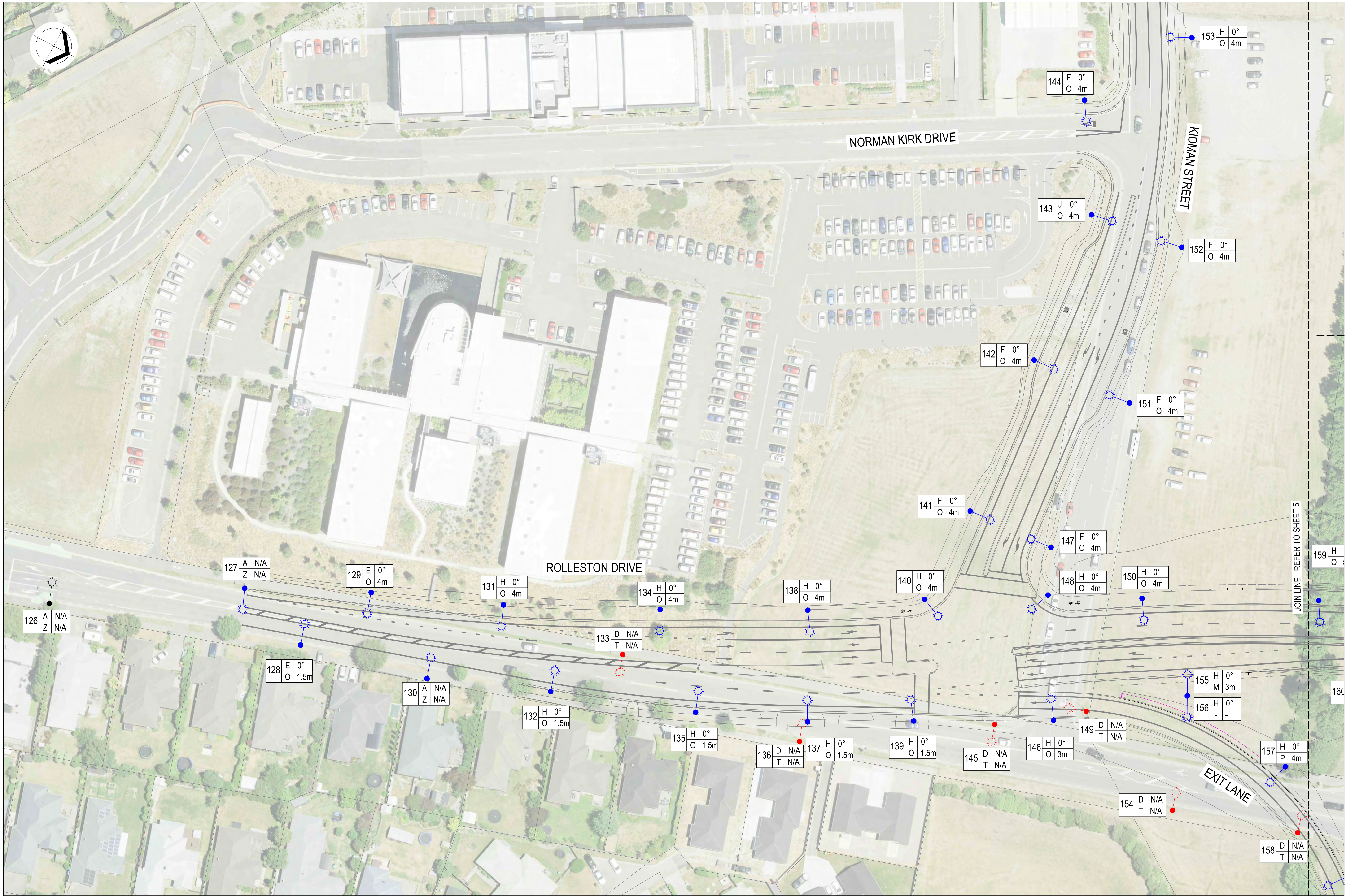
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1:500	Drawn	R.ANDERSON	03.04.24	
Reduced Scale (A3)	Design Verifier			
1:1000	Design Check			
	* Refer to Revision 1 for Original Signature			Date



Client: SH1 ROLLESTON ACCESS IMPROVEMENTS PACKAGE 2

Title: LIGHTING PLANS SHEET 4 OF 7

Discipline	CIVIL ENGINEERING
Drawing No.	3338703-20-CU-3514
Rev.	A



PRELIMINARY
NOT FOR CONSTRUCTION

A		FOR PRELIMINARY SAFE SYSTEM AUDIT	RAA	KC	DA	06.11.24
No.	Revision		By	Chk	Appd	Date

Original Scale (A1)	Design	M.HARRIS	28.03.24	Approved For Construction*
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Reduced Scale (A3)	Design Verifier			
1:1000	Dwg Check			
* Refer to Revision 1 for Original Signature				Date

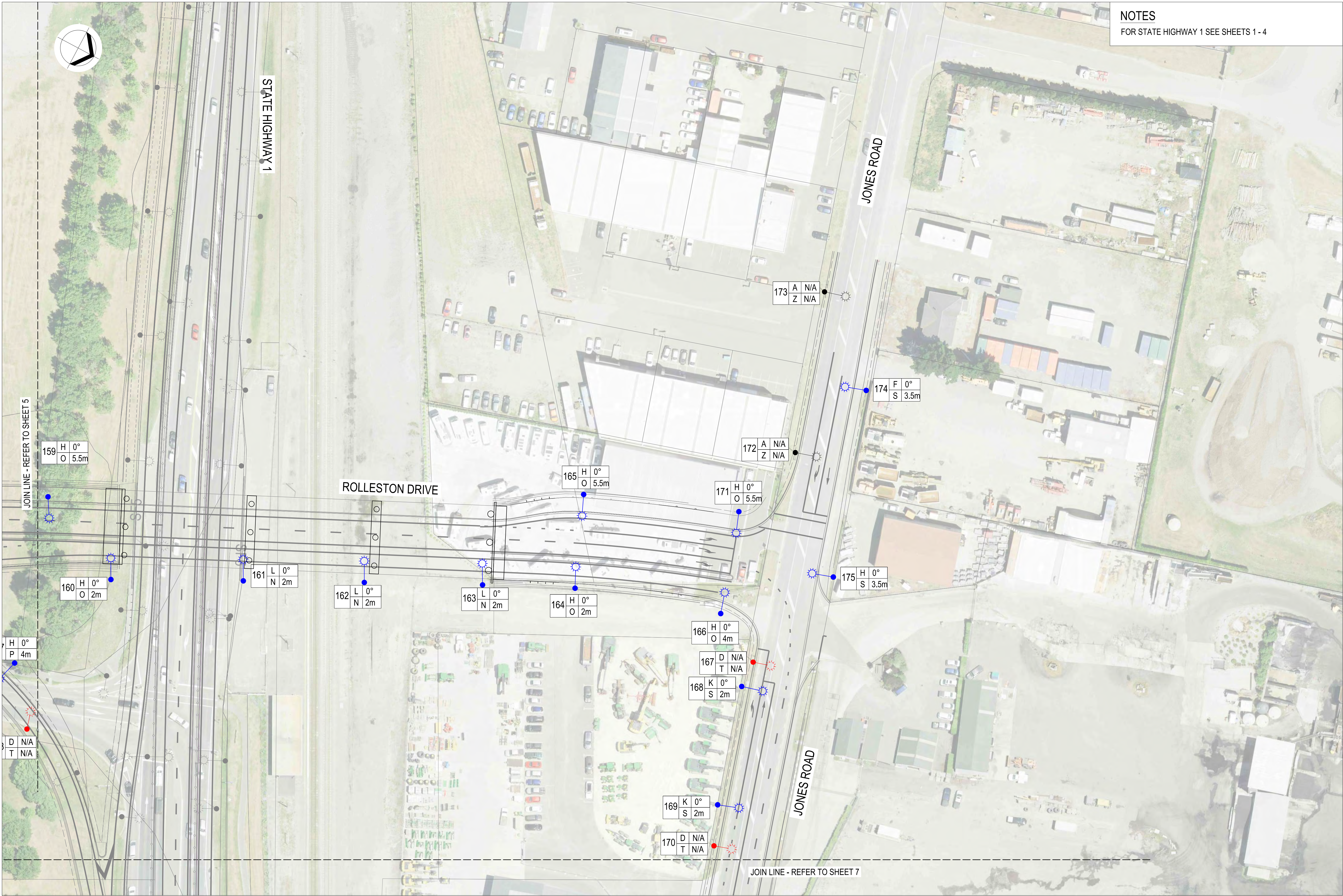


Client: SH1 ROLLESTON
ACCESS IMPROVEMENTS
PACKAGE 2

Title: LIGHTING PLANS
SHEET 5 OF 7

Discipline	CIVIL ENGINEERING
Drawing No.	3338703-20-CU-3515
Rev.	A

NOTES
FOR STATE HIGHWAY 1 SEE SHEETS 1 - 4



A	FOR PRELIMINARY SAFE SYSTEM AUDIT	RAA	KC	DA	06.11.24				
No.	Revision	By	Chk	Appd	Date				

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Reduced Scale (A3)	Design Verifier			
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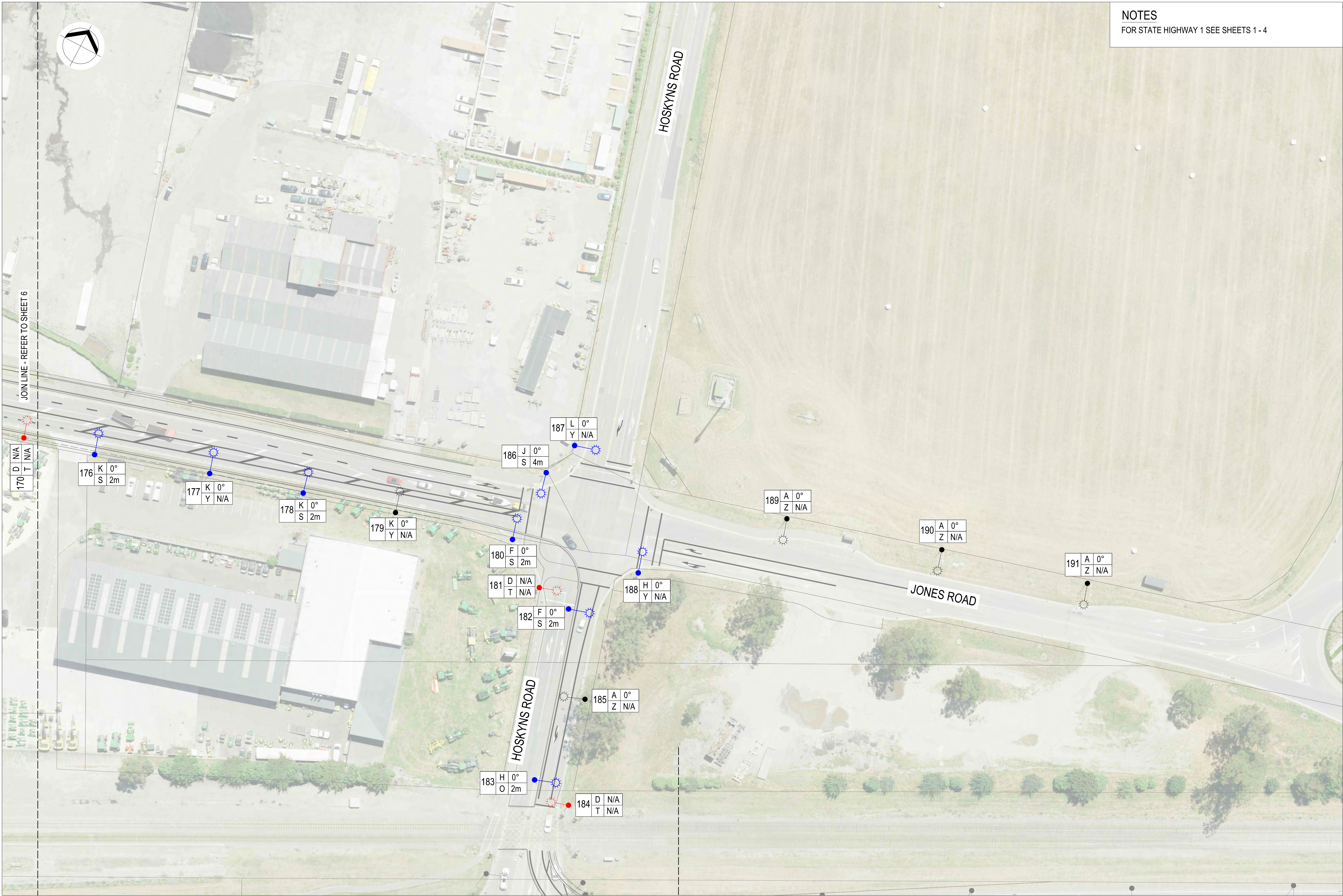


Client: SH1 ROLLESTON
ACCESS IMPROVEMENTS
PACKAGE 2

Title: LIGHTING PLANS
SHEET 6 OF 7

Discipline	CIVIL ENGINEERING
Drawing No.	3338703-20-CU-3516
Rev.	A

NOTES
FOR STATE HIGHWAY 1 SEE SHEETS 1 - 4



A	FOR PRELIMINARY SAFE SYSTEM AUDIT	RAA	KC	DA	06.11.24
No.	Revision	By	Chk	Appd	Date

Original Scale (A1)	Design	M.HARRIS	02.04.24	Approved For Construction*
1:500	Drawn	R ANDERSON	02.04.24	
Reduced Scale (A3)	Design Verifier			
1:1000	Dwg Check			
	* Refer to Revision 1 for Original Signature			
				Date



Client: SH1 ROLLESTON
ACCESS IMPROVEMENTS
PACKAGE 2

Title: LIGHTING PLANS
SHEET 7 OF 7

Discipline	CIVIL ENGINEERING
Drawing No.	3338703-20-CU-3517
Rev.	A

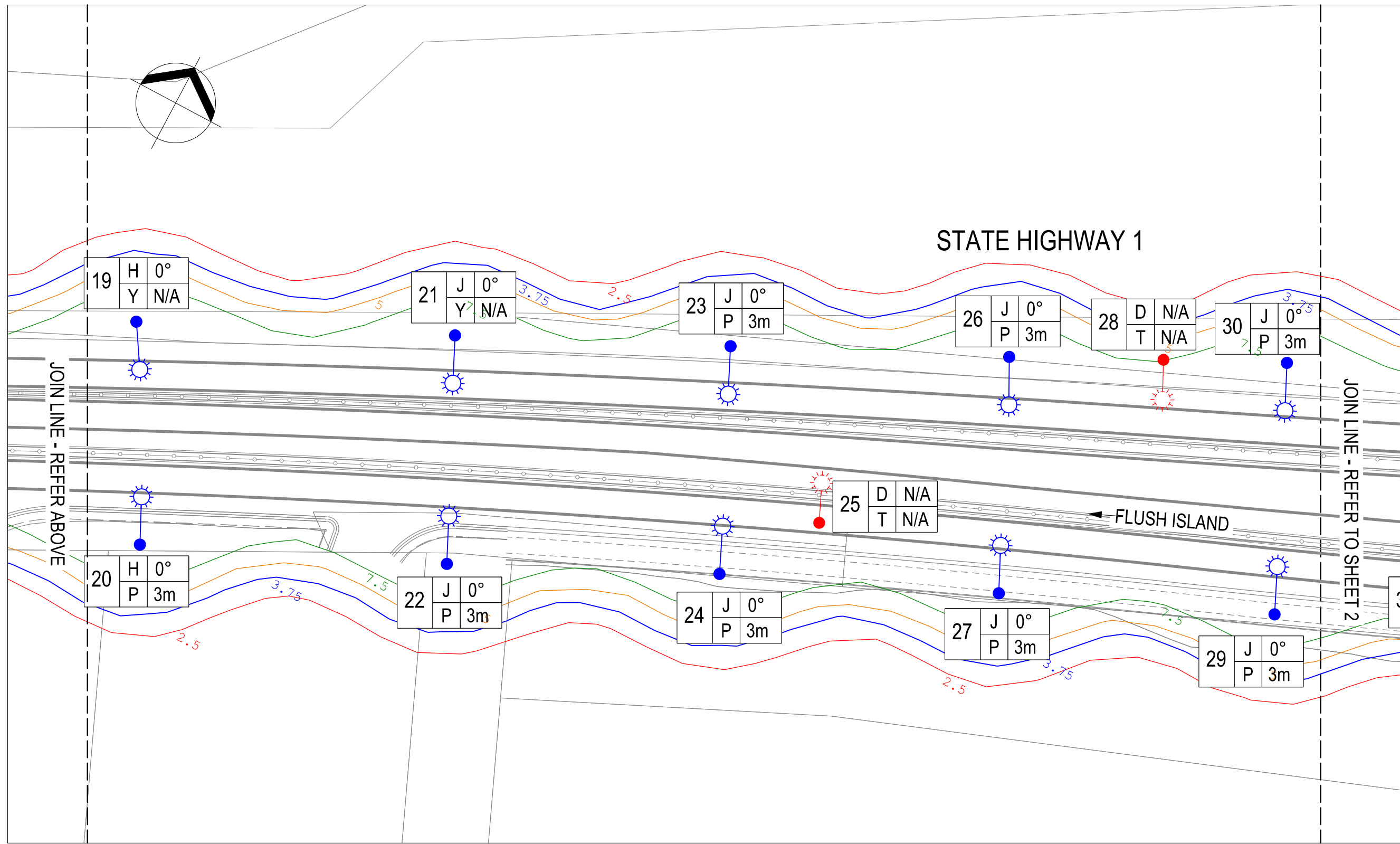
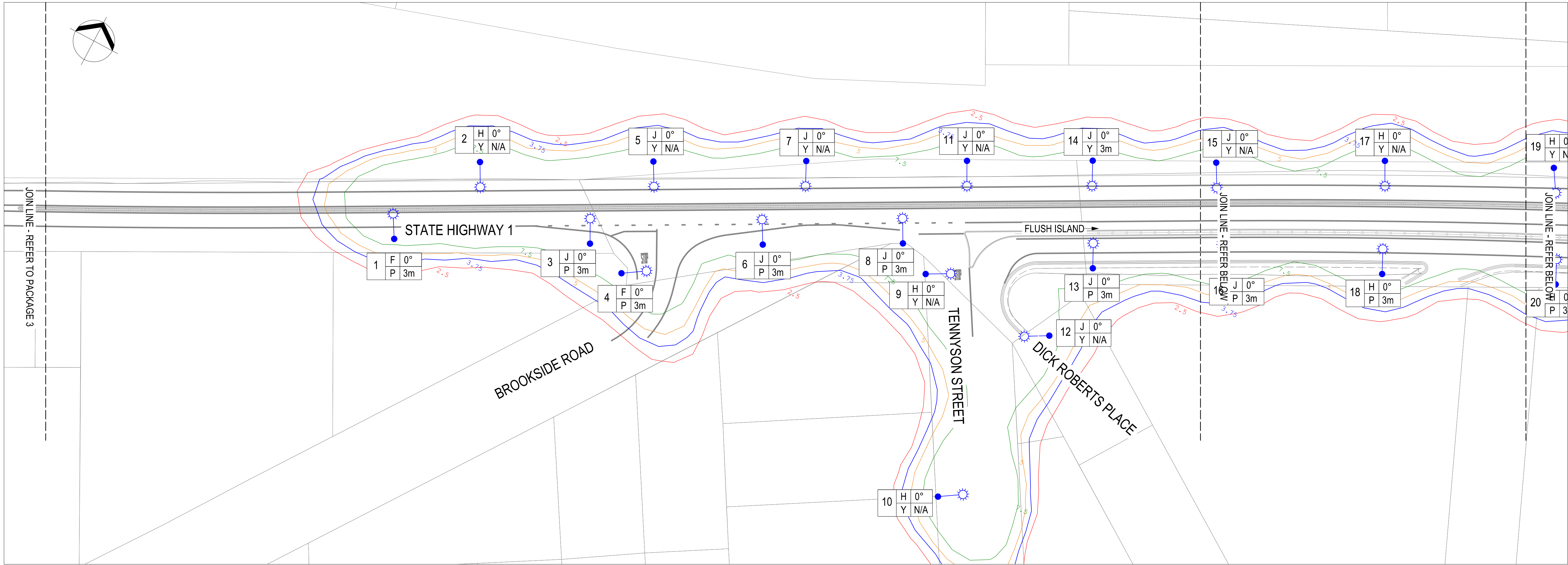


TABLE 3.1 VALUES OF LTP FOR NEW ZEALAND CATEGORY V LIGHTING - AS/NZS 1158.1.1:2022								
1	2	3	4	5	6	7	8	9
LIGHTING SUBCATEGORY	LIGHT TECHNICAL PARAMETERS (LTP)							
	AVERAGE CARRIAGEWAY LUMINANCE ^(a,b) (L) cd/m ²	OVERALL UNIFORMITY ^(c,d) (U _o)	LONGITUDINAL UNIFORMITY ^(b) (U _l)	THRESHOLD INCREMENT ^(d,e) (TI) %	SURROUND VERGE ILLUMINANCE ^(b) (E _{sl} and E _{sr}) %	POINT HORIZONTAL ILLUMINANCE ^(a,b) (E _{ph}) lx	ILLUMINANCE (HORIZONTAL) UNIFORMITY ^(d) (U _{E1})	UPWARD WASTE LIGHT RATIO ^(d) (UWLR)
V3	0.75	0.33	0.3	12	50	7.5	8	0.01

- a. THESE VALUES ARE MAINTAINED.
b. CONFORMANCE IS ACHIEVED BY BEING GREATER THAN OR EQUAL TO THE APPLICABLE TABLE VALUE.
c. THE VALUE OF U_l MAY BE 0.32 OR 0.31 PROVIDED THE VALUE FOR L IS 5% OR 10% RESPECTIVELY, ABOVE THE SPECIFIED VALUE IN COLUMN 2.
d. CONFORMANCE IS ACHIEVED BY BEING LESS THAN OR EQUAL TO THE APPLICABLE TABLE VALUE.
e. WHERE LEGACY INSTALLATIONS WITH HID LUMINAIRES ARE UPGRADES, THE THRESHOLD INCREMENT VALUE MAY BE NO GREATER THAN THE EXISTING HID INSTALLATION AND MAY NOT EXCEED 20%
f. V4 IS THE MINIMUM SUBCATEGORY RECOMMENDED FOR APPLICATION IN NEW ZEALAND.

LIGHTING DESIGN CALCULATION SUMMARY										
AREA	2 AVERAGE CARRIAGEWAY LUMINANCE (L) cd/m ²	3 OVERALL UNIFORMITY (U _o)	4 LONGITUDINAL UNIFORMITY (U _l)	5 THRESHOLD INCREMENT (TI) %	6 SURROUND VERGE ILLUMINANCE (E ⁻³) lx	7 POINT HORIZONTAL ILLUMINANCE (E ⁻¹⁰) lx	8 ILLUMINANCE (HORIZONTAL) UNIFORMITY (U ^{-E1})	9 UPWARD WASTE LIGHT RATIO (UWLR)	MAX SPACING (m)	COMPLIANCE TO CATEGORY
MAIN SOUTH ROAD SH1 TECEO 1000mA	0.75	0.40	0.53	5.02	76.07	N/A	N/A	0.00	58	V3
SH1/ BROOKSIDE ROAD INTERSECTION	N/A	N/A	N/A	N/A	N/A	10.7	2.6	N/A	N/A	V3
SH1/ TENNYSON STREET INTERSECTION	N/A	N/A	N/A	N/A	N/A	12.8	2.48	N/A	N/A	V3
SH1 NORTHBOUND LANE DIVERGENCE	N/A	N/A	N/A	N/A	N/A	12.0	2.79	N/A	N/A	V3

PRELIMINARY
NOT FOR CONSTRUCTION

Original Scale (A1) 1:500 Reduced Scale (A3) 1:1000				Design Drawn Dig Verifier Dig Check				M.HARRIS R.ANDERSON 03.04.24 03.04.24				Approved For Construction Date			
A				FOR PRELIMINARY SAFE SYSTEM AUDIT				RAA				06.11.24			
No.				Revision				By				Date			



Client: SH1 ROLLESTON
ACCESS IMPROVEMENTS
PACKAGE 2

Title: LIGHTING CALCULATION PLAN
SHEET 1 OF 7

Discipline: CIVIL ENGINEERING
Drawing No: 3338703-20-CU-3521
Rev: A

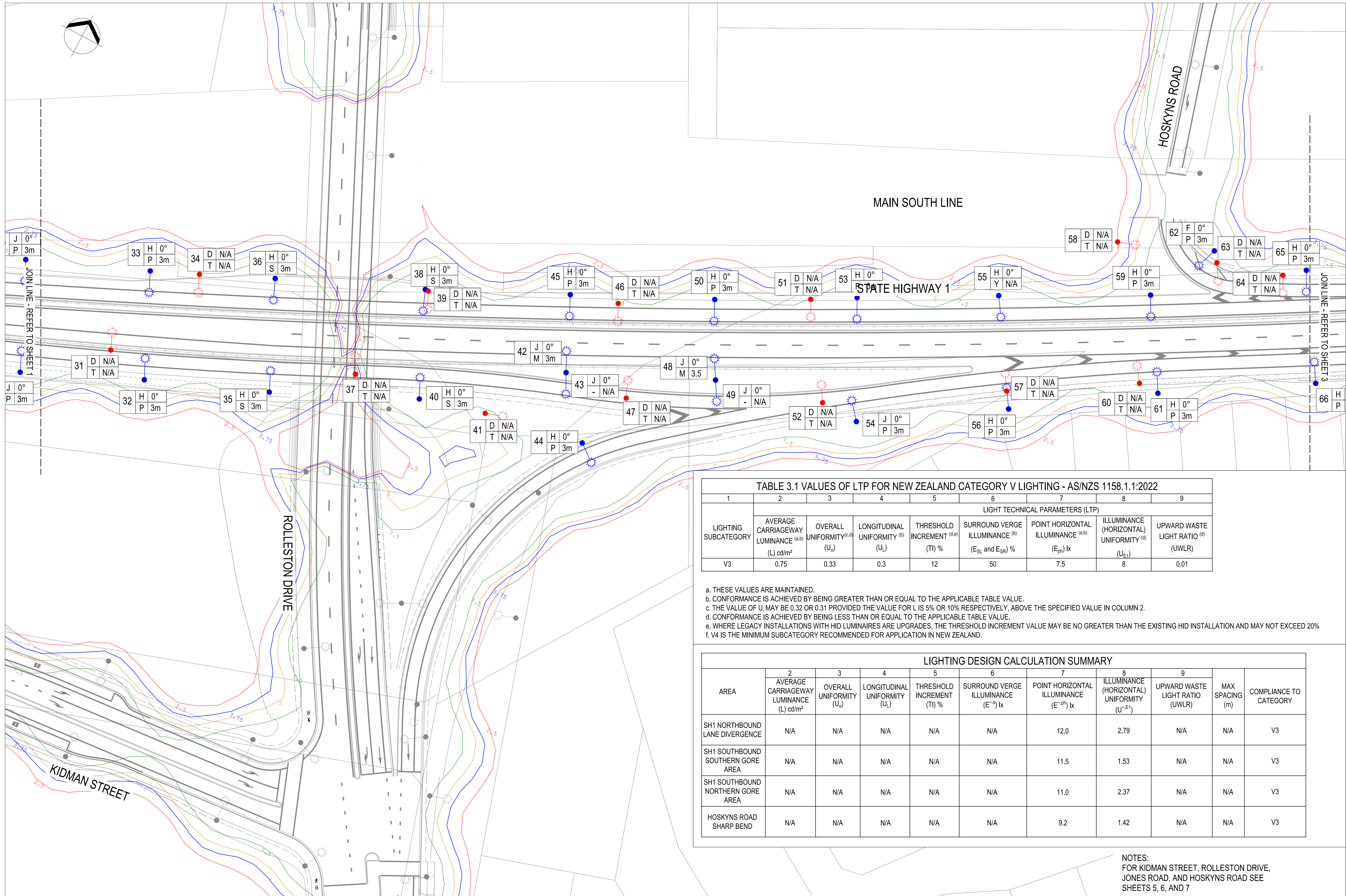


TABLE 3.1 VALUES OF LTP FOR NEW ZEALAND CATEGORY V LIGHTING - AS/NZS 1158.1.1:2022								
1	2	3	4	5	6	7	8	9
LIGHTING SUBCATEGORY	LIGHT TECHNICAL PARAMETERS (LTP)							
	AVERAGE CARRIAGEWAY LUMINANCE ^(a,b)	OVERALL UNIFORMITY ^(c,d)	LONGITUDINAL UNIFORMITY ^(b)	THRESHOLD INCREMENT ^(d,e)	SURROUND VERGE ILLUMINANCE ^(b)	POINT HORIZONTAL ILLUMINANCE ^(a,b)	ILLUMINANCE (HORIZONTAL) UNIFORMITY ^(d)	UPWARD WASTE LIGHT RATIO ^(d)
	(L) cd/m ²	(U _o)	(U _L)	(TI) %	(E _{SV} and E _{SR}) %	(E _{ph}) lx	(U _{E1})	(UWLR)
V3	0.75	0.33	0.3	12	50	7.5	8	0.01

- a. THESE VALUES ARE MAINTAINED.
b. CONFORMANCE IS ACHIEVED BY BEING GREATER THAN OR EQUAL TO THE APPLICABLE TABLE VALUE.
c. THE VALUE OF U_L MAY BE 0.32 OR 0.31 PROVIDED THE VALUE FOR L IS 5% OR 10% RESPECTIVELY, ABOVE THE SPECIFIED VALUE IN COLUMN 2.
d. CONFORMANCE IS ACHIEVED BY BEING LESS THAN OR EQUAL TO THE APPLICABLE TABLE VALUE.
e. WHERE LEGACY INSTALLATIONS WITH HID LUMINAIRES ARE UPGRADES, THE THRESHOLD INCREMENT VALUE MAY BE NO GREATER THAN THE EXISTING HID INSTALLATION AND MAY NOT EXCEED 20%
f. V4 IS THE MINIMUM SUBCATEGORY RECOMMENDED FOR APPLICATION IN NEW ZEALAND.

LIGHTING DESIGN CALCULATION SUMMARY										
AREA	2 AVERAGE CARRIAGEWAY LUMINANCE (L) cd/m ²	3 OVERALL UNIFORMITY (U _o)	4 LONGITUDINAL UNIFORMITY (U _L)	5 THRESHOLD INCREMENT (TI) %	6 SURROUND VERGE ILLUMINANCE (E ⁻³) lx	7 POINT HORIZONTAL ILLUMINANCE (E ⁻³) lx	8 ILLUMINANCE (HORIZONTAL) UNIFORMITY (U ^{-E1})	9 UPWARD WASTE LIGHT RATIO (UWLR)	MAX SPACING (m)	COMPLIANCE TO CATEGORY
SH1 NORTHBOUND LANE DIVERGENCE	N/A	N/A	N/A	N/A	N/A	12.0	2.79	N/A	N/A	V3
SH1 SOUTHBOUND SOUTHERN GORE AREA	N/A	N/A	N/A	N/A	N/A	11.5	1.53	N/A	N/A	V3
SH1 SOUTHBOUND NORTHERN GORE AREA	N/A	N/A	N/A	N/A	N/A	11.0	2.37	N/A	N/A	V3
HOSKYN'S ROAD SHARP BEND	N/A	N/A	N/A	N/A	N/A	9.2	1.42	N/A	N/A	V3

NOTES:
FOR KIDMAN STREET, ROLLESTON DRIVE,
JONES ROAD, AND HOSKYN'S ROAD SEE
SHEETS 5, 6, AND 7

Original Scale (A1) 1:500				Design M.HARRIS 03.04.24				Approved For Construction 03.04.24			
Reduced Scale (A3) 1:1000				Drawn R.ANDERSON 03.04.24				Date			
Revision				By				Date			
A FOR PRELIMINARY SAFE SYSTEM AUDIT				RAA				06.11.24			
Revision				By				Date			



Client: NZ TRANSPORT AGENCY
Project: SH1 ROLLESTON ACCESS IMPROVEMENTS PACKAGE 2

Title: LIGHTING CALCULATION PLAN
SHEET 2 OF 7

Discipline: CIVIL ENGINEERING
Drawing No.: 3338703-20-CU-3522
Rev: A

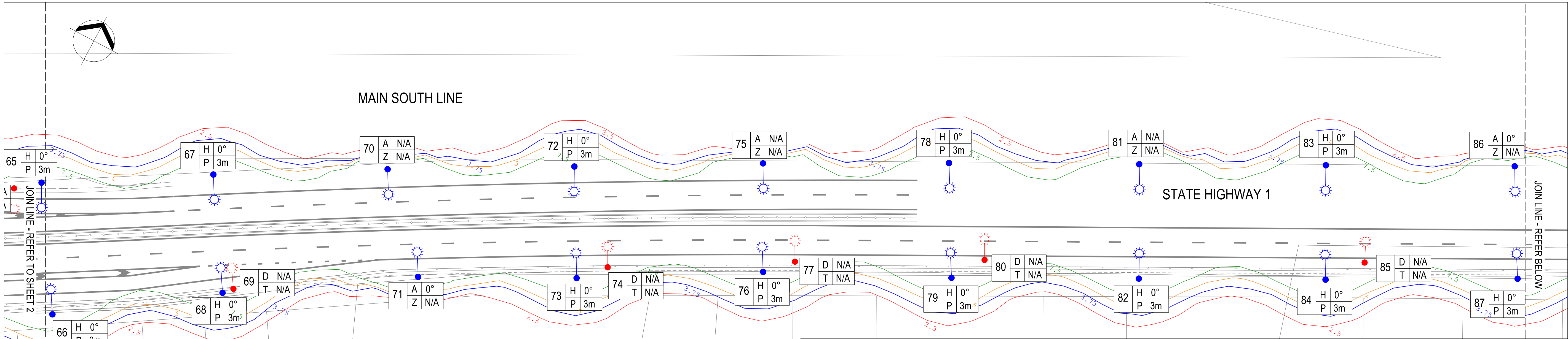
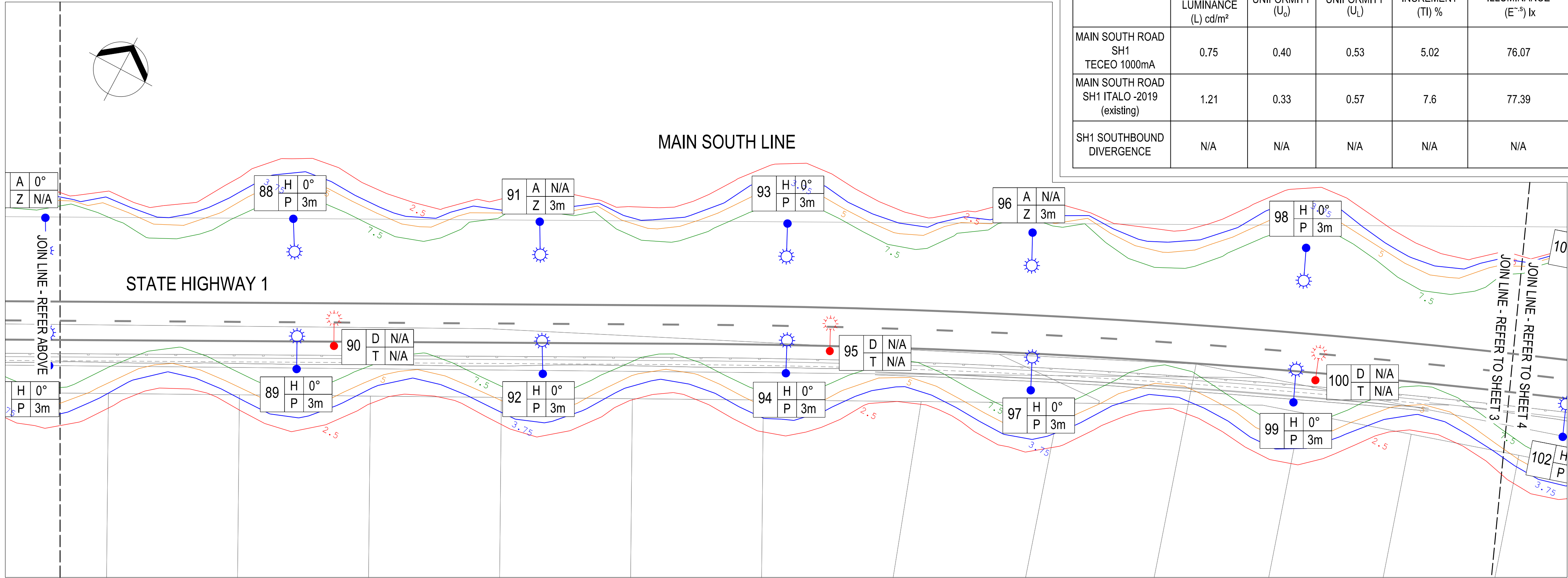


TABLE 3.1 VALUES OF LTP FOR NEW ZEALAND CATEGORY V LIGHTING - AS/NZS 1158.1.1:2022								
1	2	3	4	5	6	7	8	9
LIGHTING SUBCATEGORY	LIGHT TECHNICAL PARAMETERS (LTP)							
	AVERAGE CARRIAGEWAY LUMINANCE ^(a,b)	OVERALL UNIFORMITY ^(c,d)	LONGITUDINAL UNIFORMITY ^(b)	THRESHOLD INCREMENT ^(e,f)	SURROUND VERGE ILLUMINANCE ^(b)	POINT HORIZONTAL ILLUMINANCE ^(a,b)	ILLUMINANCE (HORIZONTAL) UNIFORMITY ^(d)	UPWARD WASTE LIGHT RATIO ^(d)
	(L) cd/m²	(U _o)	(U _l)	(TI) %	(E _{SL} and E _{SR}) %	(E _{ph}) lx	(U _{E1})	(UWLR)
	V3	0.75	0.33	0.3	12	50	7.5	8

- a. THESE VALUES ARE MAINTAINED.
b. CONFORMANCE IS ACHIEVED BY BEING GREATER THAN OR EQUAL TO THE APPLICABLE TABLE VALUE.
c. THE VALUE OF U_o MAY BE 0.32 OR 0.31 PROVIDED THE VALUE FOR L IS 5% OR 10% RESPECTIVELY, ABOVE THE SPECIFIED VALUE IN COLUMN 2.
d. CONFORMANCE IS ACHIEVED BY BEING LESS THAN OR EQUAL TO THE APPLICABLE TABLE VALUE.
e. WHERE LEGACY INSTALLATIONS WITH HID LUMINAIRES ARE UPGRADES, THE THRESHOLD INCREMENT VALUE MAY BE NO GREATER THAN THE EXISTING HID INSTALLATION AND MAY NOT EXCEED 20%.
f. V4 IS THE MINIMUM SUBCATEGORY RECOMMENDED FOR APPLICATION IN NEW ZEALAND.

LIGHTING DESIGN CALCULATION SUMMARY										
AREA	2 AVERAGE CARRIAGEWAY LUMINANCE (L) cd/m ²	3 OVERALL UNIFORMITY (U _o)	4 LONGITUDINAL UNIFORMITY (U _l)	5 THRESHOLD INCREMENT (TI) %	6 SURROUND VERGE ILLUMINANCE (E ⁻³) lx	7 POINT HORIZONTAL ILLUMINANCE (E ⁻³) lx	8 ILLUMINANCE (HORIZONTAL) UNIFORMITY (U ^{-E1})	9 UPWARD WASTE LIGHT RATIO (UWLR)	MAX SPACING (m)	COMPLIANCE TO CATEGORY
MAIN SOUTH ROAD SH1 TECEO 1000mA	0.75	0.40	0.53	5.02	76.07	N/A	N/A	0.00	58	V3
MAIN SOUTH ROAD SH1 ITALO -2019 (existing)	1.21	0.33	0.57	7.6	77.39	N/A	N/A	0.00	54	V3
SH1 SOUTHBOUND DIVERGENCE	N/A	N/A	N/A	N/A	N/A	8.1	2.62	N/A	N/A	V3



FOR PRELIMINARY SAFE SYSTEM AUDIT		RAA	KC	DA	06.11.24
No.	Revision	By	Chk	Appd	Date
Original Scale (A1)		Design	M.HARRIS	03.04.24	Approved For Construction*
Reduced Scale (A3)		Drawn	R.ANDERSON	03.04.24	Date
1:500		Design Verifier			
1:1000		Drop Check			
* Refer to Revision 1 for Original Signature					



Client: SH1 ROLLESTON ACCESS IMPROVEMENTS PACKAGE 2

Title: LIGHTING CALCULATION PLAN SHEET 3 OF 7

Discipline: CIVIL ENGINEERING
Drawing No: 3338703-20-CU-3523
Rev: A

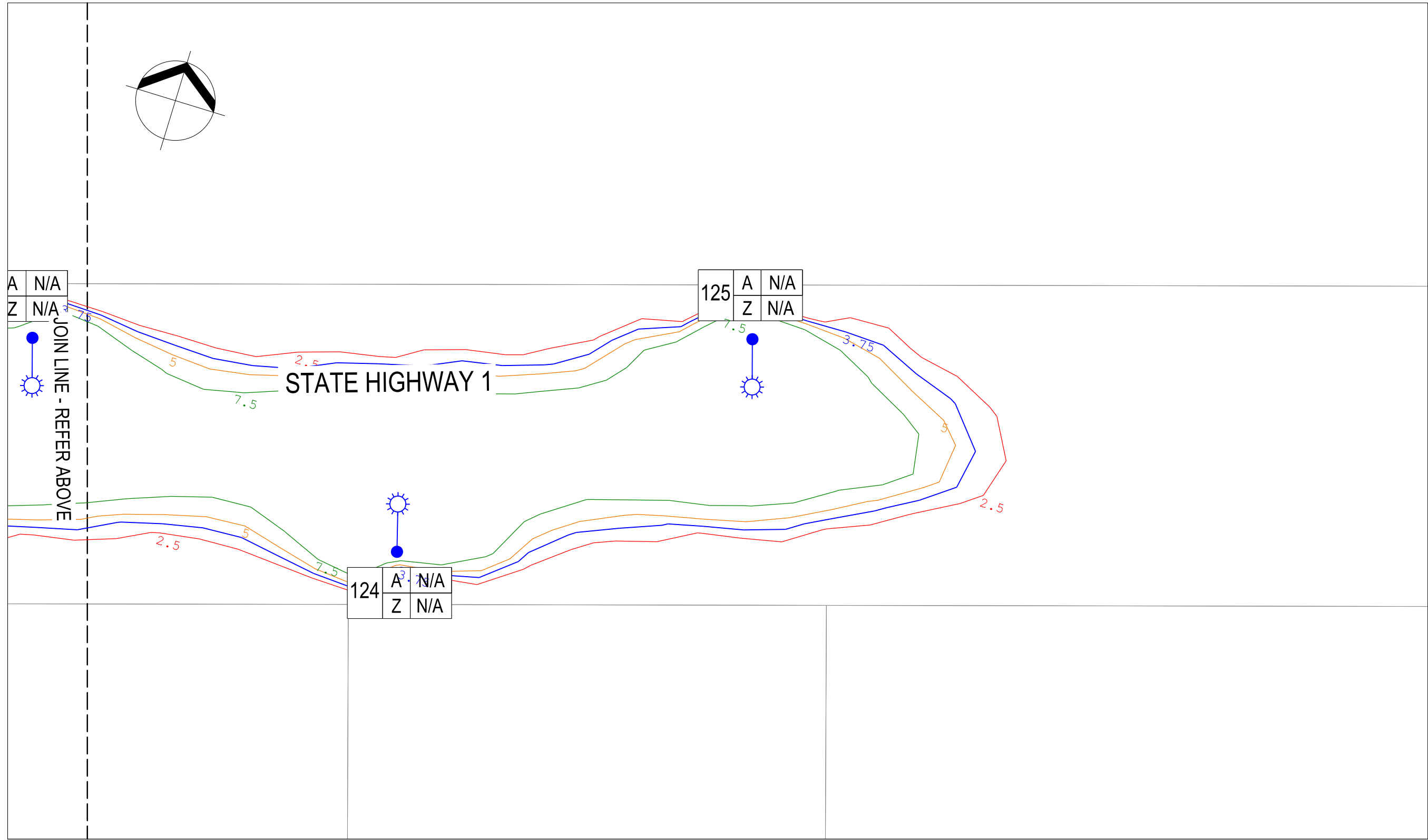
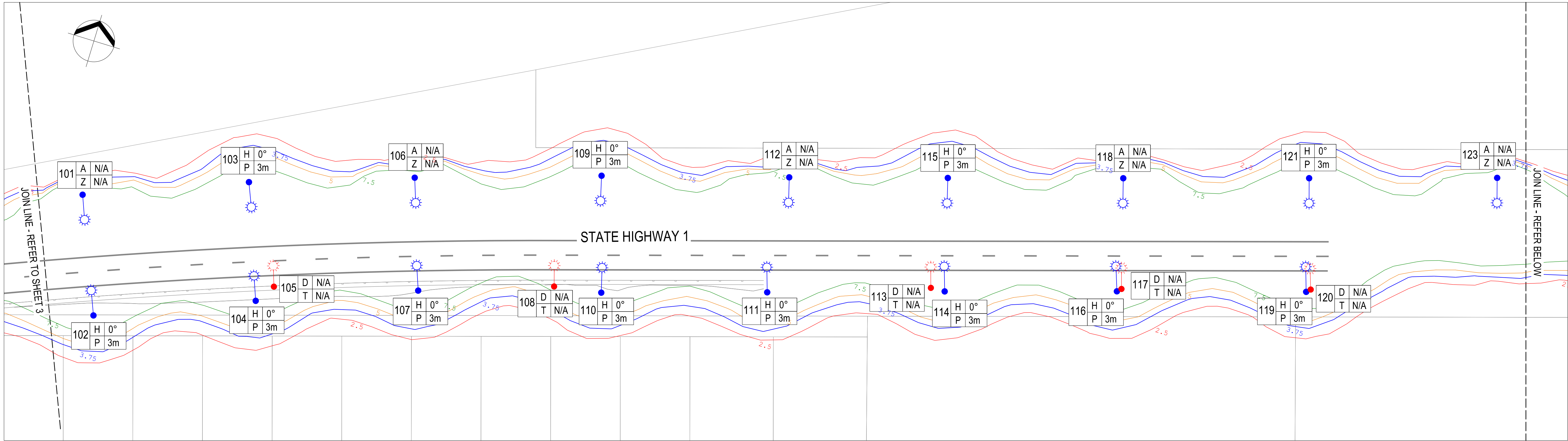


TABLE 3.1 VALUES OF LTP FOR NEW ZEALAND CATEGORY V LIGHTING - AS/NZS 1158.1.1:2022								
1	2	3	4	5	6	7	8	9
LIGHTING SUBCATEGORY	LIGHT TECHNICAL PARAMETERS (LTP)							
	AVERAGE CARRIAGEWAY LUMINANCE ^(a,b) (L) cd/m ²	OVERALL UNIFORMITY ^(c,d) (U _o)	LONGITUDINAL UNIFORMITY ^(b) (U _L)	THRESHOLD INCREMENT ^(d,e) (TI) %	SURROUND VERGE ILLUMINANCE ^(b) (E _{SL} and E _{SR}) %	POINT HORIZONTAL ILLUMINANCE ^(a,b) (E _{ph}) lx	ILLUMINANCE (HORIZONTAL) UNIFORMITY ^(d) (U _{E1})	UPWARD WASTE LIGHT RATIO ^(d) (UWLR)
	V3	0.75	0.33	0.3	12	50	7.5	8

- a. THESE VALUES ARE MAINTAINED.
b. CONFORMANCE IS ACHIEVED BY BEING GREATER THAN OR EQUAL TO THE APPLICABLE TABLE VALUE.
c. THE VALUE OF U_o MAY BE 0.32 OR 0.31 PROVIDED THE VALUE FOR L IS 5% OR 10% RESPECTIVELY, ABOVE THE SPECIFIED VALUE IN COLUMN 2.
d. CONFORMANCE IS ACHIEVED BY BEING LESS THAN OR EQUAL TO THE APPLICABLE TABLE VALUE.
e. WHERE LEGACY INSTALLATIONS WITH HID LUMINAIRES ARE UPGRADES, THE THRESHOLD INCREMENT VALUE MAY BE NO GREATER THAN THE EXISTING HID INSTALLATION AND MAY NOT EXCEED 20%.
f. V4 IS THE MINIMUM SUBCATEGORY RECOMMENDED FOR APPLICATION IN NEW ZEALAND.

LIGHTING DESIGN CALCULATION SUMMARY										
AREA	2 AVERAGE CARRIAGEWAY LUMINANCE (L) cd/m ²	3 OVERALL UNIFORMITY (U _o)	4 LONGITUDINAL UNIFORMITY (U _L)	5 THRESHOLD INCREMENT (TI) %	6 SURROUND VERGE ILLUMINANCE (E ^{-s}) lx	7 POINT HORIZONTAL ILLUMINANCE (E ^{-ph}) lx	8 ILLUMINANCE (HORIZONTAL) UNIFORMITY (U ^{-E1})	9 UPWARD WASTE LIGHT RATIO (UWLR)	MAX SPACING (m)	COMPLIANCE TO CATEGORY
MAIN SOUTH ROAD SH1 TECEO 1000mA	0.75	0.40	0.53	5.02	76.07	N/A	N/A	0.00	58	V3
MAIN SOUTH ROAD SH1 ITALO -2019 (existing)	1.21	0.33	0.57	7.6	77.39	N/A	N/A	0.00	54	V3

Original Scale (A1)				Design				Approved For Construction			
1:500				M.HARRIS				03.04.24			
Reduced Scale (A3)				R.ANDERSON				03.04.24			
1:1000				* Refer to Revision 1 for Original Signature							



Client: SH1 ROLLESTON ACCESS IMPROVEMENTS PACKAGE 2

Title: LIGHTING CALCULATION PLAN SHEET 4 OF 7

Discipline: CIVIL ENGINEERING
Drawing No: 3338703-20-CU-3524
Rev: A

a. THESE VALUES ARE MAINTAINED.

b. CONFORMANCE IS ACHIEVED BY BEING GREATER THAN OR EQUAL TO THE APPLICABLE TABLE VALUE.

c. THE VALUE OF U MAY BE 0.32 OR 0.31 PROVIDED THE VALUE FOR L IS 5% OR 10% RESPECTIVELY, ABOVE THE SPECIFIED VALUE IN COLUMN 2.

d. CONFORMANCE IS ACHIEVED BY BEING LESS THAN OR EQUAL TO THE APPLICABLE TABLE VALUE.

e. WHERE LEGACY INSTALLATIONS WITH HID LUMINAIRES ARE UPGRADES, THE THRESHOLD INCREMENT VALUE MAY BE NO GREATER THAN THE EXISTING HID INSTALLATION AND MAY NOT EXCEED 20%.

f. V4 IS THE MINIMUM SUBCATEGORY RECOMMENDED FOR APPLICATION IN NEW ZEALAND.

ROLLESTON DRIVE

EXIT LANE

126 A N/A
Z N/A

127 A N/A
Z N/A

128 E 0°
O 1.5m

129 E 0°
O 4m

130 A N/A
Z N/A

131 H 0°
O 4m

132 H 0°
O 1.5m

133 D N/A
T N/A

134 H 0°
O 4m

135 H 0°
O 1.5m

136 D N/A
T N/A

137 H 0°
O 1.5m

138 H 0°
O 4m

139 H 0°
O 1.5m

140 H 0°
O 4m

141 F 0°
O 4m

145 D N/A
T N/A

146 H 0°
O 3m

147 F 0°
O 4m

148 H 0°
O 4m

149 D N/A
T N/A

150 H 0°
O 4m

154 D N/A
T N/A

155 H 0°
M 3m

156 H 0°
-

157 H 0°
P 4m

158 D N/A
T N/A

159 H 0°
O 4m

160 P 3m

JOIN LINE - REFER TO SHEET 5

[illegible]

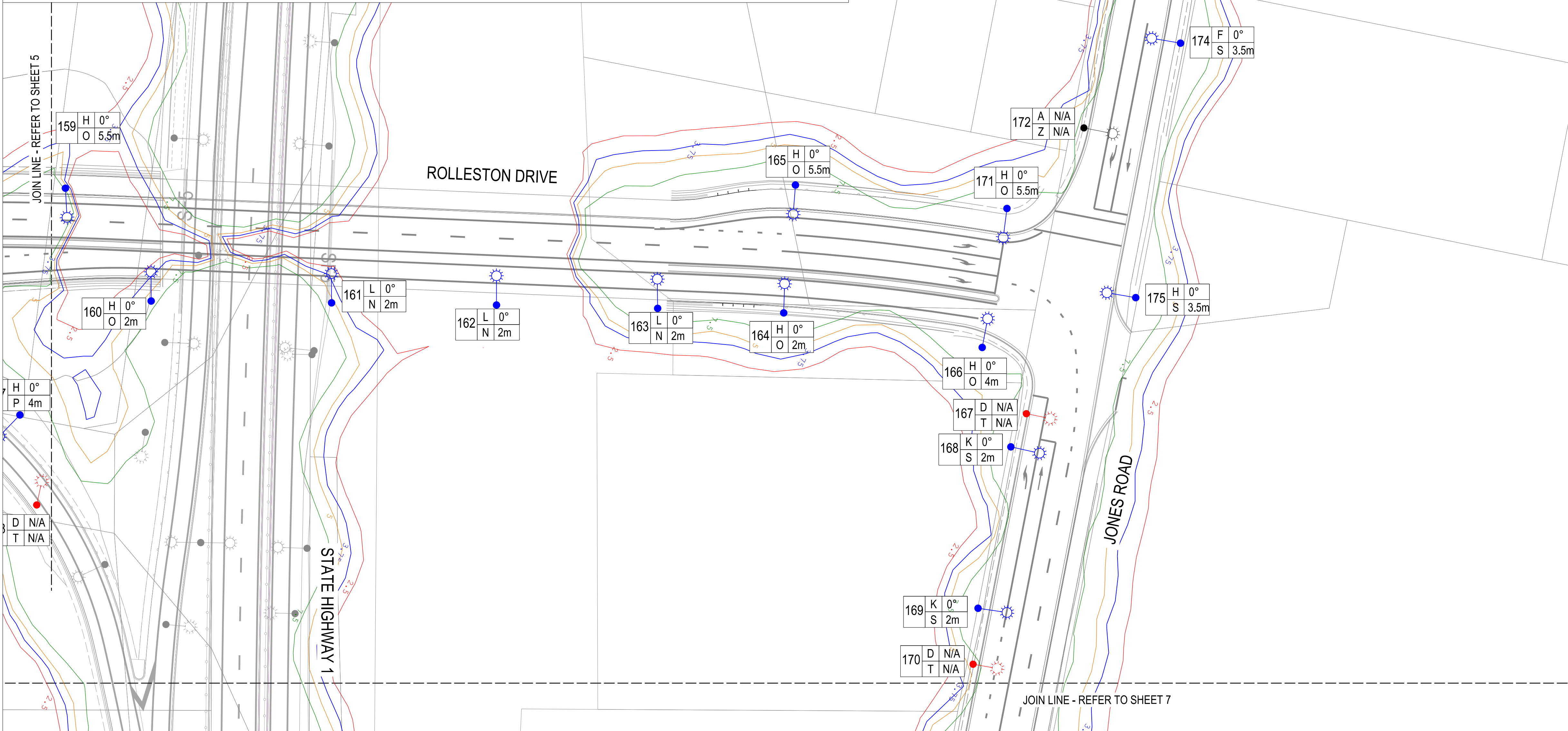
Discipline		CIVIL ENGINEERING
Drawing No.	3338703-20-CU-3525	Rev. A

TABLE 3.1 VALUES OF LTP FOR NEW ZEALAND CATEGORY V LIGHTING - AS/NZS 1158.1.1:2022								
1	2	3	4	5	6	7	8	9
LIGHTING SUBCATEGORY	LIGHT TECHNICAL PARAMETERS (LTP)							
	AVERAGE CARRIAGEWAY LUMINANCE ^(a,b)	OVERALL UNIFORMITY ^(c,d)	LONGITUDINAL UNIFORMITY ^(b)	THRESHOLD INCREMENT ^(d,e)	SURROUND VERGE ILLUMINANCE ^(b)	POINT HORIZONTAL ILLUMINANCE ^(a,b)	ILLUMINANCE (HORIZONTAL) UNIFORMITY ^(d)	UPWARD WASTE LIGHT RATIO ^(d)
	(L) cd/m ²	(U _o)	(U _L)	(TI) %	(E _{SL} and E _{SR}) %	(E _{ph}) lx	(U _{E1})	(UWLR)
V3	0.75	0.33	0.3	12	50	7.5	8	0.01

- a. THESE VALUES ARE MAINTAINED.
b. CONFORMANCE IS ACHIEVED BY BEING GREATER THAN OR EQUAL TO THE APPLICABLE TABLE VALUE.
c. THE VALUE OF U_o MAY BE 0.32 OR 0.31 PROVIDED THE VALUE FOR L IS 5% OR 10% RESPECTIVELY, ABOVE THE SPECIFIED VALUE IN COLUMN 2.
d. CONFORMANCE IS ACHIEVED BY BEING LESS THAN OR EQUAL TO THE APPLICABLE TABLE VALUE.
e. WHERE LEGACY INSTALLATIONS WITH HID LUMINAIRES ARE UPGRADES, THE THRESHOLD INCREMENT VALUE MAY BE NO GREATER THAN THE EXISTING HID INSTALLATION AND MAY NOT EXCEED 20%.
f. V4 IS THE MINIMUM SUBCATEGORY RECOMMENDED FOR APPLICATION IN NEW ZEALAND.

LIGHTING DESIGN CALCULATION SUMMARY										
AREA	2 AVERAGE CARRIAGEWAY LUMINANCE (L) cd/m ²	3 OVERALL UNIFORMITY (U _o)	4 LONGITUDINAL UNIFORMITY (U _l)	5 THRESHOLD INCREMENT (TI) %	6 SURROUND VERGE ILLUMINANCE (E ⁻²⁰) lx	7 POINT HORIZONTAL ILLUMINANCE (E ⁻²⁰) lx	8 ILLUMINANCE (HORIZONTAL) UNIFORMITY (U ^{-E1})	9 UPWARD WASTE LIGHT RATIO (UWLR)	MAX SPACING (m)	COMPLIANCE TO CATEGORY
OVERPASS ITALO S05 4-100.7	0.75	0.41	0.62	5.51	80.74	N/A	N/A	0.00	42	V3
ROLLESTON DRIVE NORTH DIVERGENCE	N/A	N/A	N/A	N/A	N/A	12.1	2.53	N/A	N/A	V3
JONES ROAD/ROLLESTON DRIVE INTERSECTION	N/A	N/A	N/A	N/A	N/A	7.5	4.53	N/A	N/A	V3

FOR STATE HIGHWAY 1 SEE SHEETS 1 - 4



Original Scale (A1)		Design	M.HARRIS	02.04.24	Approved For Construction
1:500		Drawn	R.ANDERSON	02.04.24	
Reduced Scale (A3)		Design Verifier			
1:1000		Design Check			
		* Refer to Revision 1 for Original Signature			

A	FOR PRELIMINARY SAFE SYSTEM AUDIT	RAA	KC	DA	06.11.24
No.	Revision	By	Chk	Appd	Date



Client: SH1 ROLLESTON ACCESS IMPROVEMENTS PACKAGE 2

Title: LIGHTING CALCULATION PLAN SHEET 6 OF 7

Discipline: CIVIL ENGINEERING
Drawing No: 3338703-20-CU-3526
Rev: A

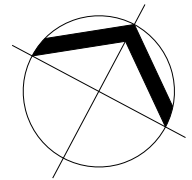
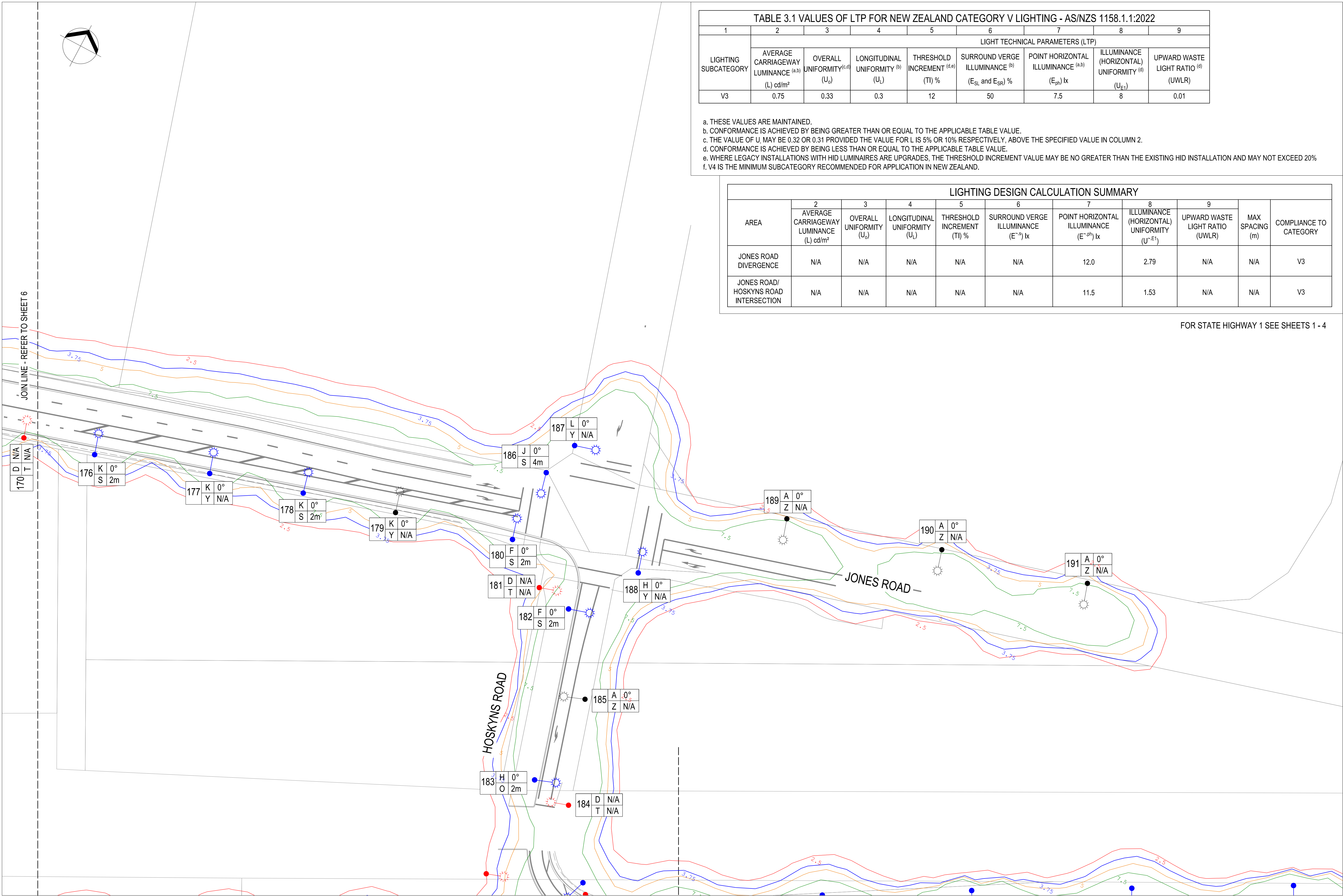


TABLE 3.1 VALUES OF LTP FOR NEW ZEALAND CATEGORY V LIGHTING - AS/NZS 1158.1.1:2022								
LIGHTING SUBCATEGORY	2	3	4	5	6	7	8	9
	LIGHT TECHNICAL PARAMETERS (LTP)							
	AVERAGE CARRIAGEWAY LUMINANCE ^(a,b) (L) cd/m ²	OVERALL UNIFORMITY ^(c,d) (U _o)	LONGITUDINAL UNIFORMITY ^(b) (U _l)	THRESHOLD INCREMENT ^(d,e) (TI) %	SURROUND VERGE ILLUMINANCE ^(b) (E _{sv} and E _{sr}) %	POINT HORIZONTAL ILLUMINANCE ^(a,b) (E _{ph}) lx	ILLUMINANCE (HORIZONTAL) UNIFORMITY ^(d) (U _{E1})	UPWARD WASTE LIGHT RATIO ^(d) (UWLR)
V3	0.75	0.33	0.3	12	50	7.5	8	0.01

- a. THESE VALUES ARE MAINTAINED.
b. CONFORMANCE IS ACHIEVED BY BEING GREATER THAN OR EQUAL TO THE APPLICABLE TABLE VALUE.
c. THE VALUE OF U_l MAY BE 0.32 OR 0.31 PROVIDED THE VALUE FOR L IS 5% OR 10% RESPECTIVELY, ABOVE THE SPECIFIED VALUE IN COLUMN 2.
d. CONFORMANCE IS ACHIEVED BY BEING LESS THAN OR EQUAL TO THE APPLICABLE TABLE VALUE.
e. WHERE LEGACY INSTALLATIONS WITH HID LUMINAIRES ARE UPGRADES, THE THRESHOLD INCREMENT VALUE MAY BE NO GREATER THAN THE EXISTING HID INSTALLATION AND MAY NOT EXCEED 20%
f. V4 IS THE MINIMUM SUBCATEGORY RECOMMENDED FOR APPLICATION IN NEW ZEALAND.

LIGHTING DESIGN CALCULATION SUMMARY										
AREA	2 AVERAGE CARRIAGEWAY LUMINANCE (L) cd/m ²	3 OVERALL UNIFORMITY (U _o)	4 LONGITUDINAL UNIFORMITY (U _l)	5 THRESHOLD INCREMENT (TI) %	6 SURROUND VERGE ILLUMINANCE (E ⁻⁵) lx	7 POINT HORIZONTAL ILLUMINANCE (E ⁻¹⁰) lx	8 ILLUMINANCE (HORIZONTAL) UNIFORMITY (U ^{-E1})	9 UPWARD WASTE LIGHT RATIO (UWLR)	MAX SPACING (m)	COMPLIANCE TO CATEGORY
JONES ROAD DIVERGENCE	N/A	N/A	N/A	N/A	N/A	12.0	2.79	N/A	N/A	V3
JONES ROAD/ HOSKYNS ROAD INTERSECTION	N/A	N/A	N/A	N/A	N/A	11.5	1.53	N/A	N/A	V3

FOR STATE HIGHWAY 1 SEE SHEETS 1 - 4



Original Scale (A1)		Design	M.HARRIS	02.04.24	Approved For Construction*
1:500		Drawn	R ANDERSON	02.04.24	
Reduced Scale (A3)		Design Verifier			
1:1000		Design Check			
		* Refer to Revision 1 for Original Signature			

A	FOR PRELIMINARY SAFE SYSTEM AUDIT	RAA	KC	DA	06.11.24
No.	Revision	By	Chk	Appd	Date



Client: SH1 ROLLESTON ACCESS IMPROVEMENTS PACKAGE 2

Title: LIGHTING CALCULATION PLAN SHEET 7 OF 7

Discipline: CIVIL ENGINEERING
Drawing No: 3338703-20-CU-3527
Rev: A